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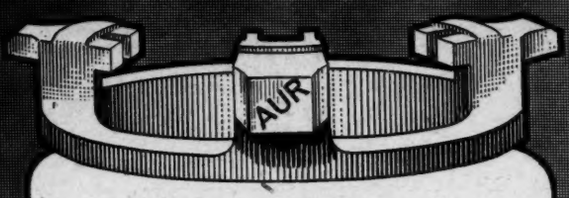

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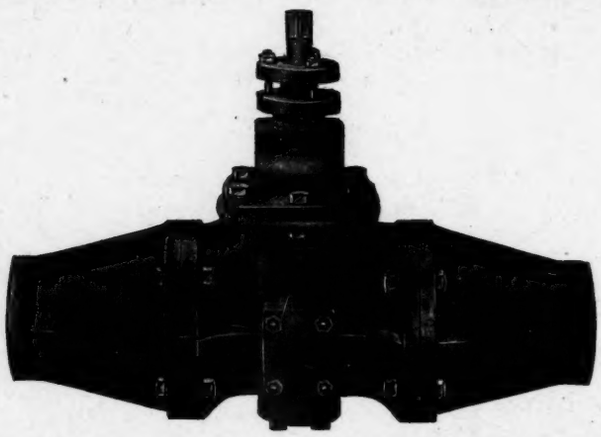

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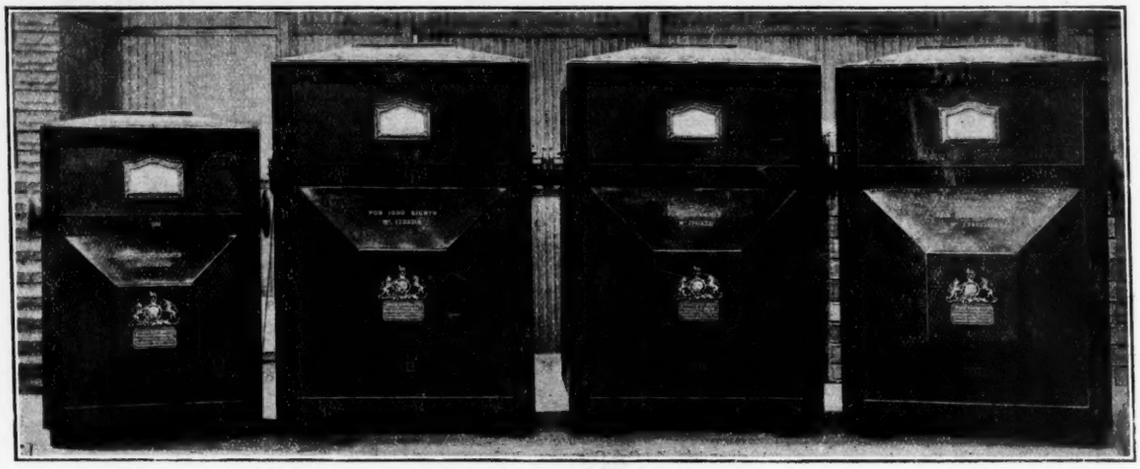

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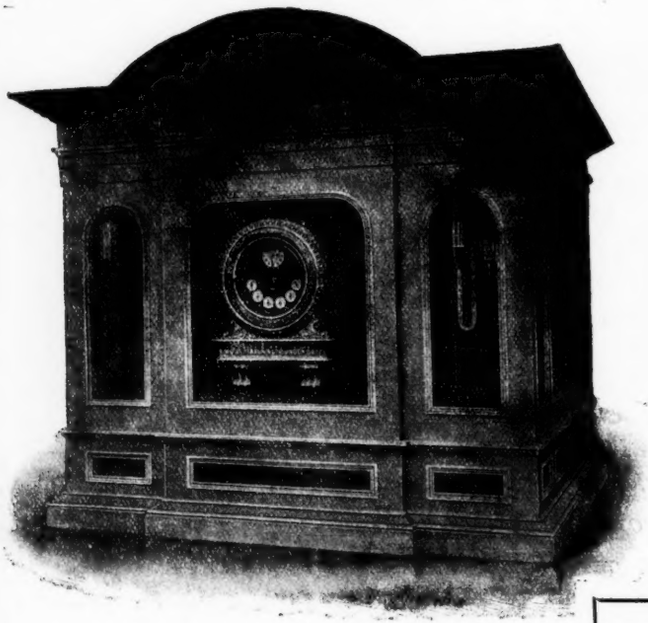

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GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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VOL. CXLVI., No. 2919.] TUESDAY, APRIL 22, 1919. [71ST YEAR.

EDITORIAL NOTES.

Waiting for a Definite Programme.

THE gas industry is still without a definite programme setting forth the line of policy which it should pursue; and there is no knowledge of anything being done to provide it with one. A condition precedent to the framing of such a programme is a thorough investigation; but, at the present time, the gas industry does not know of anything moving in this way. We have now a National Gas Council representing the industry—the first time that the industry (*quâ* industry) has been fully organized, though the Central Executive Board would be all the more representative of the varied interests if its composition was somewhat modified. That, however, by the way. Enormous responsibility rests upon the new Council—greater responsibility than there ever was upon the old Council, which had the same name, but not the character, status, and power with which this one has been invested through being elected and authorized by the gas undertakings. Perhaps the Council has not yet had time to get into proper stride, and has had sufficient to do to look after details and matters of immediate importance. These things cannot be neglected; but beyond them there is something of a very solid nature that has to be—that must be—carried out in the interests of the industry, and which need not interfere much with the work that urgently presses. It is the future of the industry that makes the responsibility so much greater; and if the National Gas Council does not realize it, the fact remains that the industry is looking to the Council to take the initial steps in providing it with a policy and programme for the future.

The first thing to be done is to determine the subjects which require investigation and report; the second step is to appoint Special Committees to make definite investigations; the third thing is to have the reports and recommendations of the Committees considered jointly by them in order to see that they co-ordinate, and have not in them proposals that are repugnant the one to the other. Then it is for the Council to act upon them.

The main subjects upon which is required a programme tracing the lines of policy are: (1) Legislation; (2) Financial Questions; (3) Gas Standards, Carbonizing, &c.; (4) Commercial Matters. Lord Moulton has told us, and we know it well, that the gas industry is working under obsolete General Acts; and it is this ancient legislation, which is altogether out of harmony with the progress and spirit of the times, that has provided our "unscientific legislators" with a foundation and with precedents from which they do not seem to dare to move a hair's breadth. They have not the competence to discriminate between real progress which is for the public benefit (as well as for that of the industry) and the obstinacy and the obstruction of public authorities. What in regard to legislation is now wanted is that the old General Gas Acts should be taken in hand, expurgated and modernized, and then for the industry through its National Council to take all steps necessary to enter into conference with the Government Departments concerned with the view to the adoption of the suggestions and the establishing of a new General Act. We need not labour the point as to the limiting and stereotyping action of the continued existence of out-of-time legislation. The financial position is a large one. It hinges upon legislative revision. But it is of such pressing importance, and covers so much, that it also requires a specially qualified Committee to thoroughly explore it, to consider schemes for betterment, and to make recommendations. The questions of gas composition and of standards is the subject of an (as yet) inaccessible report by the Fuel Research Board which is now lying on the table of the House of Commons; and there is also the research that is proceeding by the Gas Investigation Committee of the Institution and of the University of Leeds. But here again, as Prof. Bone in his recent Cantor Lectures urged, a Scientific Committee, with some representative practitioners upon it, is needed to carry the investigation further, and to watch and guard and advise the industry as to the lines it should take. There is the question of a commercial policy, under new and prospective conditions. The British Commercial Gas Association could well arrange on behalf of the Council for an investigation of this, with the co-operation of the London Coke Sales Committee, the Sulphate of Ammonia, the Benzol, and the other Associations, including the Society of British Gas Industries.

Now, as to the Committees. It has been an object of the "JOURNAL" for many months past to help forward a very widely held view in the industry, that a Departmental Committee should be appointed (upon which should be qualified men in all the departments of the industry's work) to investigate and report upon its position and the development of its inherent potentiality in serving the country and the public. But though this idea was carried far, and got before the President of the Board of Trade (Sir Albert Stanley) and the Minister of Reconstruction (Dr. Addison), it has since been hung-up at these stages. This being so, then let the industry make a move on its own account, and show that it has initiative and intention of its own. We have influential men in and attached to the industry. For a Special Committee on the revision of gas legislation, there are Lord Moulton, Mr. Balfour Browne, K.C., Mr. Honoratus Lloyd, K.C., Mr. R. J. Neville Neville, Mr. A. M. Paddon, Mr. Jacques Abady, and others of the Parliamentary Bar or practising as Parliamentary Agents, who if approached would consent to render assistance on a Special Committee. In regard to finance, one can readily roll-off the names of half-a-dozen Chartered Accountants who are closely allied with the gas industry who would, we are equally certain, be right willing to serve on a Special Committee in this connection. Prof. Smithells and Prof. Bone could readily nominate a Scientific Committee (including themselves) who should, with men of good technical qualification and daily work in the industry, investigate, report, watch, and advise, in relation to gas quality and use and other scientific matters that come within their province, in this present critical period in the history of the industry. As to the commercial part of the policy and general objects of the industry, we have indicated, at the end of the previous paragraph, the quarters from which a Committee could be drawn for this purpose. The industry has need of the best brains and specialists it can command; and we hope that now and for ever it has abandoned the folly of being guided solely by bodies constituted wholly of officials. Officials themselves must see the absurdity of this, and the wisdom of a well-balanced constitution of highly qualified elements.

In the interests of the future of the industry do, then, let us get to work on some systematic lines, review the position from "A" to "Z," and produce something upon which to work zealously and with intention to achieve—something which will bear the impress of good authority, and can be accepted by the industry as the guide for work, and the goal to which work should be directed in present circumstances, always subject to revision to keep pace with accretions of knowledge or changing economic environment. The gas industry wants to know just what should be done. It is looking to the National Gas Council—the centralized operating force of the industry—to take the initiative in

bringing into existence the means that will give the industry the necessary information. The work must be attacked, and that boldly. The sooner it is done the better. And the longer we have procrastination, the worse it will be for the whole industry.

Other Eyes on the Virgin Soil.

The extension of areas supplied from centrally-situated gas-works is an old subject with the "Journal;" and the list of precedents is annually extending which confirm the view that it is to the weal of both central gas-works and outlying districts when the former take over the supply of the latter from undertakings that, owing to their modest size and perhaps location in regard to transport, are not well-conditioned for economical manufacture. The advantage to the outer districts has corporeal attestation in the lower price at which a gas-works centrally well placed can supply them; and the advantage to the supplying works is that, the larger the aggregate business and the greater its diversity, the lower as a general rule are the average working and general charges. This may not always be immediately apparent; but it is a matter in which one must look ahead, and from more than one direction. To-day, too, one must take particular note of external developments; and, so taking note, it will be abundantly clear that a good policy is to get supply mains laid into virgin areas as soon as possible. The day has passed when gas undertakings can afford to treat outlying districts with indifference. There must be closer inspection of their value; there must be greater liberality, and less of an inexorable insistence on a 10 p.ct. guarantee upon capital costs. Conditions have altered, and are still altering. The gas industry has to think prospectively, as well as currently; and fortunately the industry is in a better position than it ever was to enlarge its ramifications so as to be ahead of external development. High-pressure transit of gas is now an old ally; and gas deprived of part of its heavy hydrocarbons, and working under a heat unit standard, is of the best character for compression and transport to distant outlying areas. Other than initial costs, the conditions are therefore exceptionally favourable for taking possession of new areas; and, combined with this, there is the pressure being exerted by external development.

Thinking prospectively, and desiring to be ahead of outside developments, instead of merely following a wait-and-see policy, will aid in many new discoveries of areas which the future interests of a concern submit should be dealt with without unnecessary delay, and the business be worked-up to its maximum as early as possible. The rough plans that have been prepared as to national electricity supply contemplate the making use of all tapable sources of waste heat for generating purposes, and the provision of electric current everywhere—no matter how great or how small the business—where it is required. Indeed, a great point has been made, throughout the recent electrical discussions, of supplies of current to villages and to farms, with the professed view of assisting the poorer areas to develop, and of gaining all possible crumbs of revenue from the sinuous cables that will stretch away from the super-power stations far over cities and towns and through the countryside. We already have one electrical writer telling us that when the villages and agricultural communities, and the areas in which new industries will rear themselves, are all supplied with electrical energy for light, heat, and power, there will then be no inducement to gas suppliers to come along and duplicate with gas-pipes the branches from the main electric cables, for the simple reason that the villages and agricultural communities are not as a rule (whatever their prospects may be) of a character that can give support to two competitors for light, heat, and power. When once they have been through the ordeal and met the expense of having their places equipped, householders and factory owners are not likely to show any immediate desire to go through the process of evicting one form of installation in order to adopt another, no matter that in the long-run it might be economical to do so. Suppose we accept all this. It follows that if the nearest gas undertaking is there first with its mains, and gets the business, there will be no necessity for electrical people to duplicate the gas-mains with electric cables. All the arguments hold good. In every way, gas distribution and installation are cheaper than electrical; and the farther away from the central station the supply of current is given, the more expensive it becomes. Yet in villages and rural areas, the purses of country folk are not so long as those of the residents in populous cities and flourishing towns; and so all the more reason why they should prefer the cheapest source for light, heat, and power. Even in cities and towns, owing to the lower consumptions of metallic filament lamps, many electric undertakings are now finding it hardly pays them to supply (for lighting only) houses below a certain size. Their experience would be worse in rural areas; for there would be small chance of getting the householders to employ electrical energy for room heating, cooking, boiling food, and getting hot water. With them, B.Th.U.'s at a reasonable price will tell.

However, the main point upon which we wish to insist is that, while every means must be taken at the gas-producing end to realize economy, the extension of the base of business is highly important—not only by promoting the use of gas from each service and increasing the number of services in the home area, but by not allowing outlying districts to remain sequestered and dormant. There are other eyes on the virgin soil.

Benzol Production for War Purposes.

There has been no rivalry between the coke-oven industry and the gas industry regarding the production of benzol and toluol during the war for munition purposes. Whatever has been done has been from patriotic motives only; and in these motives was found the incentive to both industries to do all that circumstances would permit. But the fact remains that, when benzol and toluol were required in enormous quantities, the coke-oven industry was not producing sufficient to meet the needs—the fast growing needs—of the Allies; and had the gas industry not been in a position to make contribution, there would have been a deplorable shortage. What the coking industry did during the war in the supply of benzol was set out in the article and table printed in last week's "Journal," and which supply an interesting supplement to the article published in our columns on Feb. 11, p. 262, in which an account was given of the work of the Gas Section of the Department of Explosives Supply. It must be remembered that (excepting the case of the Gas Light and Coke Company) the gas industry was not, at the commencement of hostilities, washing gas for the extraction of benzol. Thus, as an integral part of its work, the process was new; whereas the coke-oven industry was then washing its gas as part of its ordinary process, though there has been ample acknowledgment that, at many coke plants, benzol production was not being carried on with the control and refinement which ensure the maximum production. A rough indication of this (it is not put forward as anything more definite) is found by dividing the bye-product coke-oven benzol production of 21,877,000 gallons in 1914 by the 5983 ovens in use, and the average per oven is found to be 3712 gallons; while in 1917 (the year of the maximum production) the yield of 33,552,000 gallons, divided by the 8219 ovens in use, averaged per oven 4082 gallons—a difference of 370 gallons per oven. Had the production per oven been in 1917 at the same rate as in 1914, the total yield in 1917 would have been 3,041,030 gallons less. The increase in the total production, while partly due to the additional ovens erected during the war, is also attributable to the general tuning-up of the plants.

In the case of the gas industry, oil-washing was only introduced at a few works in the spring of 1915; and it was not until August of that year that an urgent demand arose for benzol, which shows that the coke-oven industry was not producing, nor could do so unaided, sufficient to meet the demands of the Allies. However, the gas industry has proved its capacity for producing benzol, and that with no more than a 5 p.ct. reduction in the calorific value of its gas. Its benzol potentiality was by no means exhausted, as is shown by the fact that in no less than 600 gas-works tar-washing has been in operation; while at only 170 works has oil-washing plant been in use, recovering, according to the class of coal carbonized, from ¾ to 3 gallons per ton, though in the majority of the works from 1 to 2 gallons per ton was steadily maintained—the extent of extraction being governed not only by the character of the coal, but by the desire not to unduly impoverish the gas, so as to avoid the complications and the difficulties associated with distribution. Nevertheless, by the special work put in by the gas industry, there were produced for war purposes 21,800,000 gallons of pure benzol, about 8,000,000 gallons of toluol, and 4,000,000 gallons of solvent naphtha. When these figures are compared with the 20 million tons of coal carbonized per annum by gas undertakings, it is very obvious that the capacity for benzol production was far from being exhausted.

As the table published last week, and supplying data from the bye-product coke-ovens in 1917 and 1918, showed, the quantity of coal carbonized in those years respectively was 15,275,267 tons, and 14,635,403 tons, and the production of crude 65's benzol was 33,552,791 and 32,162,598 gallons, or an average of 2·19 gallons per ton. This is a very good average, though everything is in favour of coke-oven plants obtaining maximum production, given proper supervision. Save, perhaps, where a contract is running for the supply of gas for town purposes of a specific calorific power, there is no reason why coke-oven gas should not be completely stripped. Moreover, the washing and cleaning of the coal (always excellent coking coal) means a larger proportion of good material from which to obtain the highest realizable yields. When consideration is given to the inferior material delivered during the war to gas-works—sometimes containing from 20 to 33 p.ct. of ash—the excess promoting loss in every direction, those works that have oil-washed compare in their yields, despite all restrictions, very favourably with those of coking plants.

In the report of the work done by the coking plants, it is stated that, after the armistice, "the production fell "rapidly." The figures show that the average production per ton in 1918 was actually the same as in 1917—viz., 2·19 gallons; so that the quoted statement cannot be construed as meaning that there was a drop in working efficiency. The falling-off, we should imagine, was rather due to the decline in the demand for metallurgical coke owing to the cessation of munitions making, and to factories not being able at a moment's notice to turn over from munitions to their ordinary lines of production. This surmise is confirmed by the fact that the number of ovens in operation increased from 8219 in 1917 to 8412 in 1918, and there was also the decline in the quantity of coal carbonized from 15,275,267 tons in 1917 to 14,635,403 tons in 1918. This recession in the quantity of coal carbonized is attributed to the serious shortage. Incidentally, it is noticed that the coke-oven make of sulphate of ammonia last year—being 134,357 tons, from 14,635,403 tons of coal—averaged only 20·5 lbs. per ton, *plus* the proportion of the 23,899 tons of concentrated ammonia produced.

Organization of the American Gas Industry.

The American Gas Association is representative of all the interests that comprise the gas industry; and we have been looking forward to obtaining an indication as to the success realized in this attempt at blending those interests. We get it in the Presidential Address of the Hon. George B. Cortelyou, which is noticed in other columns. At the time of the meeting, the membership consisted of nine holding companies, 264 gas companies, 92 manufacturing companies, and 1401 individual members. It is a strong organization, both numerically and in composition. The gas companies represent approximately 60 p.ct. of the gas supply of the United States; and the Association is out to secure a 100 p.ct. representation of the interests of the industry. We wish them "good luck" in the effort; for we believe with Mr. Cortelyou that "great advantages come from union in a common interest and a common cause." Upon a vast amount of work general and sectional committees are already engaged, proving that, war difficulties notwithstanding, our American colleagues do not intend to allow the grass to grow under their feet, nor the future of the industry to suffer from the want of far-reaching investigation.

The Juniors and the Salaries Question.

It has been remarked on previous occasions that for the low salaries which some gas engineers and managers are being paid, they themselves are much to blame for having originally taken positions at a remuneration below the value of technical qualification and executive responsibility. We know that it is a great temptation to an assistant, even at the sacrifice of some salary, to secure the position of a chief at another works, and so become better qualified for applying later for a position of still higher value. This is not always good policy. Occupying a position at a low salary is by some administrators taken as the measure of the worth of a man when applying for a fresh situation, rather than the extra experience that he has accumulated, and the additional responsibility that he will be called upon to shoulder. Junior engineers are therefore intimately interested in this salaries question—particularly those who are now on the look-out for higher positions, and those who will be doing so before long. Mr. R. B. Waddell (of Polmont), in his Presidential Address to the Scottish Junior Gas Association (Eastern District) last Saturday, made reference to the subject; and it is plain that his opinion is that much of the trouble is due to the underestimation of one's own capabilities. This is no doubt true in many cases where capacity really exists; but it is often found that some of the men with the least capacity, and men whom the industry could well do without, have excessive notions as to their capabilities, until events bring them down to their proper level. But those with good capacity will be better serving themselves, the profession, and the industry by not being over-impatient, and by holding-out for a fair remuneration right from the start. If the gas profession can only establish an organization that will be educative and protective in this matter, administrators will all learn (what some of them have not yet learned) that capacity should have its fair reward, and that in the engineer and manager capacity is more important to them than incapacity. There is as much difference in capacity in men as there is between a bad machine and a good machine, or a plant in good condition and a plant in bad condition.

Steaming in Horizontals.

Mr. Waddell, in the same address, gave some encouragement to those who are practising steaming in horizontal retorts. He has found that it pays, though he at first met with difficulties which have succumbed to ingenuity. The steam pressure should not be too high. The steam should be superheated; and this can be done within the setting. It must be passed into the retort at a slow rate of travel, and be very evenly distributed, so as to increase the contact with the incandescent coke. With care and attention, the perforated pipes used only require renewing once every four or five weeks. Without steaming with the coal he uses, Mr. Waddell was obtaining from the class of coal he deals with 10,530 c.ft. of gas per ton; with steaming, he gets another 1500 c.ft. An analysis of the gas and comparative particulars as to calorific power would be interesting as soon as Mr. Waddell has the necessary apparatus for making the tests. The tar and liquor sold per ton has risen from 43·6 to 49·01 gallons. It would be instructive to know whether the intrinsic value has been maintained, or whether the extra production is largely represented by water.

Economy of Large Gas-Engines.

A paper by Mr. H. Pilling, of which we give the text elsewhere in this issue, shows that the last word has not been said on the generation of power by large gas-engines. Some electrical engineers (to whom any direct use of gas is a matter for hate) would have the industrial world believe that the steam-boiler and the turbine carry everything before them. They do not go so far as to say superiority rests with the steam-boiler and the turbine in economy per B.H.P.-hour, but that whatever working economy the large gas-engine possesses over its competitors is entirely annihilated by the difficulties which, they say, are inherent to it. The difficulties largely attest a want of supervision on the part of the technical officer whose duty it is to give it. If the starting, working, examination, and cleaning instructions that Mr. Pilling gives in his paper are followed, there will be nothing much of which to complain. As to economy, even with blast-furnace gas of 105 B.Th.U. per cubic foot, Mr. Pilling shows that gas-engines will produce a B.H.P. at a cost of about 10,000 B.Th.U., which is a consumption the lowness of which cannot be equalled by any existing steam-engine or turbine. When it is considered that a modern condensing engine uses 11½ lbs. of superheated steam per B.H.P.-hour, and requires approximately 23,000 B.Th.U. in the coal or blast-furnace gas fed to the boilers, and that a modern turbine needs about 11 lbs. of superheated high-pressure steam per KW.-hour, or 15,500 B.Th.U. per B.H.P.-hour in gas or coal, and smaller turbines 17,000 to 23,000 B.Th.U., there can be no two questions as to whether (where economy is the essential) the gas should be used direct in the gas-engine or under boilers for the generation of steam, besides which the cooling water required by the former per B.H.P. is infinitesimal as compared with the quantity required for boiler-feed and steam-condensing purposes. Mr. Pilling includes a little table early in his paper which will give electrical engineers some valuable information, in condensed

form, as to the economy in electricity generation of gas-engines such as those he is dealing with compared with medium-sized turbines.

Distribution of Benzol.

We see that the National Benzol Company, Ltd., are now at work. Advertisements are appearing in the motor papers, announcing that the Company have taken over the work of distributing and marketing benzol on behalf of the producers, that the motor spirit supplied is standardized quality, yielding an increased mileage combined with greater economy in running costs. Motorists are asked to encourage their retailers to supply home-produced motor spirit; and garage owners and retailers are advised to insist on benzol to the standard specification. A list of manufacturers of benzol spirit is included in the advertisements.

Dearer Iron and Steel.

The direct subsidies which the iron and steel manufacturers have been receiving from the Government will be withdrawn on the 30th inst.; and thereafter the entire cost of manufacture will have to be borne by makers. This was foreshadowed in the editorial article, published on March 11, on "The Cost of Labour and Materials and Gas Plant Contracts;" and it was then intimated that gas-plant manufacturers, the same as others, would in the result have to pay more for the iron and steel they required. How much more is not at the moment known. But from the 30th inst. there will be practically no subsidized iron and steel; for all stock exceeding by 100 tons the quantity held on Oct. 31, 1915, or Oct. 31, 1918, whichever may be the greater, will be subject to a refund to the Government of 30s. per ton—this, of course, not including material already incorporated in any structure or plant or required for work in progress. Fortunate are those gas-works whose contracts are in progress.

The Miners' Resolve.

The final figures of the ballot of the miners regarding the acceptance of the Sankey report are now available. Acceptance gained 693,084 votes, and rejection only 76,992—a majority of 616,092 in favour of taking the generous offer. It would have been sheer madness not to have accepted the offer, though, at the conference at Southport last Wednesday, at which the figures were announced, it was spoken of as "an instalment." However, the Coal Commission will now be in a position to proceed with the other matters referred to them; and the result of their deliberation may determine the question of the future ownership and control of the coal mines.

The Model Electrical Combination.

The group of North-East Coast Electricity Supply Companies (in which Mr. C. H. Merz is professionally and otherwise interested) has been held-up as a pattern to the United Kingdom of what is requisite to ensure a low-priced supply of electricity. This was in the report of the Power Sub-Committee; but there are some unbelieving people who opine that the electrical combination there is not all that it is painted. Municipalities round about are not satisfied with it; and Mr. Andrew Gemmell is persuaded to such a degree that there is no possibility of even shaking his conviction that "it would be difficult to imagine an organization more dangerous to industrial progress and to sections of its own investors than the holding company system practised since 1906 in the North of England by the Cleveland group of electric power companies, strengthened against public policy by a 'union of interests' by amalgamation of the Cleveland group and the Newcastle group of power companies effected in 1917." Mr. Gemmell says this in a letter to the "North Mail." He also asserts that this electrical combination has continued to employ methods by which "not the lowest possible prices have been assured to the users of electric power, but extravagant rewards have been assured or guaranteed for years to come by the use made of outside companies like the Waste-Heat Company, interposed by the Cleveland holding Company itself, an intervening Company between consumers and the authorized undertakers appointed by Parliament." Mr. Gemmell inquires how the lowest possible prices of electricity are to be ensured to the industries of the North of England to enable them to compete against foreign enterprise unless the arrangements are cancelled by which the revenues of parliamentary undertakings will continue to be depleted for years to come to redeem the capital of an outside company, besides giving it other bountiful benefits. In his opinion, it is important that the industrial community should be on the alert to see that financial aid by the State is not granted to this powerful organization until its good and evil have been sifted to the bottom. Mr. Gemmell evidently does not love the North-East electrical combination.

RETORT-CARBON ORDER SUSPENDED.

Under date of the 18th inst., an order was made by the Minister of Munitions suspending until further notice the "Gas-Works Retort-Carbon, &c., Control Order," dated the 19th of April, 1918.

It is, however, provided that suspension shall not affect the previous operation of the Order or the validity of any action taken under it, or the liability to any penalty or punishment in respect of any contravention or failure to comply with the Order prior to the suspension, or any proceeding or remedy in respect of any penalty or punishment.

PERSONAL.

The Directors of the Aldershot Gas, Water, and District Lighting Company, at their meeting on the 11th inst., promoted Mr. A. V. Barraclough, A.M.Inst.Mech.E., to the position of Gas and Water Engineer. Mr. Barraclough has been with the Company since May, 1916, as Chief Engineering Assistant. He was previously with Messrs. Aldridge & Ranken. Mr. B. W. Gothard, A.M.I.E.E., is the Electrical Engineer to the Company, and Mr. W. Fish, A.C.I.S., is the Secretary.

On Messrs. Anderson Bros. being appointed Engineers to the Deal and Walmer Gas and Electricity Company, Mr. W. Lister resigned the position of Manager to the undertaking, and was presented by the Directors with a sum of money as a token of appreciation of his services to the Company during an exceedingly trying time, throughout which the relations of the Board with him have been of the friendliest nature. Mr. Lister has also been presented by the employees with a purse of money. In making the presentation, Mr. G. Redsull spoke of the regard in which Mr. Lister was held by the men. The removal of Mr. J. Paterson from Waterford to Deal was mentioned in the "Journal" a fortnight ago.

The Directors of the Cowdenbeath Gas Company have appointed Mr. Jas. J. Scott to succeed his father as Engineer and Manager of the Company, who have one of the largest plants in Fife. Mr. Scott served his articles with the Cowdenbeath Company, under his father, after having served an apprenticeship to mechanical engineering. He was appointed in 1908 to surpervise the erection of the new gas-works, the laying of pipes, and all work in connection with the introduction of a gas supply to the district of Kennoway and Windygates, and on completion was appointed Manager. In 1910 he was selected to undertake the management of the Largo Gas-Works, in conjunction with the Kennoway works, and in 1913 was appointed to act as Secretary to both these concerns. During the time Mr. Scott has been at Kennoway and Largo, he has done valuable work in developing the two new enterprises, and in putting them on a sound business basis. He has taken great interest in street lighting, and completed the whole work of three special lighting areas on behalf of the Fife County Council; and he has introduced a system of operating the automatic street lighting apparatus which has been freely adopted all over the country. Mr. Scott has always taken a keen interest in the Scottish Junior Gas Association (Eastern District), having been President during 1914-15-16-17, and contributed several very instructive papers. He holds certificates from the City and Guilds of London Institute for Gas Engineering and Gas Supply.

Mr. M. F. Fogarty, the Manager of the Warrenpoint Gas-Works, is leaving to take up a similar position in Cahir (co. Tipperary).

Mr. J. Albinson, B.Sc., A.I.C., of Macclesfield, who has been appointed Chemist to the Bolton Corporation Gas Department, studied at the Manchester University under Prof. Harold B. Dixon, in the School of Chemistry, and took the degree of B.Sc., with second-class honours, in 1915. He served with the Royal Engineers in France from July, 1915, to January, 1919, and while on active service was elected an associate of the Institute of Chemistry.

North of England Gas Managers' Association.—The annual meeting of the Association will be held, on the 3rd prox., in Newcastle, under the presidency of Mr. Norman S. Cox, of Sunderland. The chief item on the agenda of business will be a lecture by Mr. Jacques Abady, on the "Commercial Position of the Gas Industry," to be followed by a discussion on the subject.

OBITUARY.

The Newcastle-upon-Tyne and Gateshead Gas Company have lost a very valued and trusted official in the person of Mr. George Henderson, their Resident Superintendent at the Redheugh Gas-Works. He was 69 years of age, and had been with the Company practically since the Redheugh works were started in 1876.

At the early age of not much more than thirty, Mr. Walter Parker, the Manager of the Ryde Gas Company, died last Tuesday, after an operation. Mr. Parker was appointed to Ryde at the end of 1916, to succeed the late Mr. F. F. Farrand. Previous to that time, he was Superintendent of the Lum Street Gas-Works of the Bolton Corporation. He served his articles under Mr. W. J. Smith, B.Sc., at Carlisle, and was afterwards placed on the staff as Assistant Engineer and Manager. This position he occupied for some five years—vacating it early in 1910, on obtaining the appointment of Chemist and Assistant to the Bolton Corporation. About eighteen months later he was placed in charge of the Gas Street works; and the results obtained there so impressed the Engineer that Mr. Parker was promoted to the larger station at Lum Street. During his service at Bolton both stations were modernized—well over £100,000 having been spent on alterations and renewals. The remodelled works in each case were placed under his direct supervision, to inaugurate the new plant, and to organize the system of working conditions. At Ryde he quickly established himself in the confidence of the Directors of the Gas Company, who, with the many friends he had made in the town, greatly deplore his death.

Presentations to Mr. Ralph Halkett.

A presentation was made to Mr. Ralph Halkett in the City Chambers, Glasgow, last Wednesday of gifts from the officials of the Glasgow Corporation Gas Department, on the occasion of his leaving to take up his new duties as General Manager of the Sheffield Gas Company. He was the recipient of a canteen of cutlery, and also umbrellas for Mrs. Halkett and himself. Mr. Webster, the Manager of the Provan Gas-Works, acted as Chairman, and Mr. Alex. Smith, the Manager of the Tradeston Gas-Works, made the presentation. Mr. Halkett, acknowledging the gifts, spoke of the cordial relations that had always existed between the officials and himself. At a meeting of the Gas Committee, Mr. Halkett was presented with a silver rose bowl; and Bailie Drummond, the Convener of the Committee, added a gold pencil-case as his own gift.

Temporary Increase of Charges Act.—The Board of Trade have received applications under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, from the Crediton Gas Company and the Hawkhurst Gas Company, Ltd.

Coke-Oven Managers' Association.—The sixth meeting of the present session of the Midland Section of the Coke-Oven Managers' Association will be held on Saturday next at the Queen's Hotel, Barnsley, when Mr. J. Thorp, of Barugh, will read a paper entitled "Some Features of Carbonization and Bye-Product Recovery."

Wales and Monmouthshire District Institution.—Wednesday, May 7, has been fixed for the meeting of the Wales and Monmouthshire District Institution of Gas Engineers and Managers, which will be held at the Gas Offices, Cardiff, under the presidency of Mr. R. G. Clarry, of Swansea. Beyond the formal business, and a motion by Mr. J. Mogford, "to consider and if approved dissolve the Special Purposes Section," there will be three discussions. One is to be opened by Mr. J. H. Canning, on the "Most Suitable Standard Quality of Gas;" another by Mr. H. D. Madden, on the "Carbonizing Plant of the Future, and the Gas Best Suited to the Consumer;" the third by Mr. J. Mogford, on the "Effect of the Ways and Communications Bill on Gas-Works." After luncheon at the Park Hotel, on the invitation of the Chairman and Directors of the Cardiff Gas Company, there will be a conference of the British Commercial Gas Association. Afternoon tea will be provided.

Coming Conferences of the B.C.G.A.—Under the auspices of the Southern District Committee of the British Commercial Gas Association, a business conference is to be held in the hall of Reading University College on Monday next, April 28, at 2 o'clock—the President of the conference being Mr. G. W. Webb, J.P., F.R.I.B.A., the Chairman of the Reading Gas Company. A welcome by the Mayor will be followed by an opening address by the President, to be replied to by the Chairman of the Executive Committee, with a statement respecting the work and policy of the Association. A discussion on this will be succeeded by another on "Gas Service in the National Housing Scheme," to be opened by Mr. W. J. Sandeman, of Croydon. Then there will be afternoon tea, and a paper by Mr. F. H. Holland, outlining a "Scheme for Sales Organization." On Friday, May 2, there is to be a similar conference at Sunderland, presided over by Alderman W. F. Vint, J.P., Mayor of Sunderland and Chairman of the Sunderland Gas Company. The conference will take place in the lecture hall of the Subscription Library, Fawcett Street, Sunderland. Mr. Holland will read his paper; and there will be another by Mr. A. B. Roxburgh, of the Newcastle Gas Company, on "Increasing the Utilities of Gas in the Home and the Factory."

AN ALKALI REPORT INDEX.

In the report for 1893 of the Chief Inspector under the Alkali Works Regulation Act, there was included a general index to the reports for the preceding thirty years; and this has now been supplemented by what will doubtless prove a highly useful Technical Index to the reports from 1894 to 1917.

The object aimed at by the inclusion of the large amount of valuable matter that appears in the reports, and the idea with which this new Technical Index has been compiled, are pointed out in a preface by the Chief Inspector (Mr. W. S. Curphey), who says: Administration under the Alkali Act is concerned primarily with the prevention of the escape of noxious and offensive gases into the atmosphere; and a strict interpretation of the clauses of the Act might appear to indicate that the Inspector should confine his attention wholly to controlling the discharge of noxious gases, and give no aid to the advance of technical science, as reflected in the laboratories and workshops of the factories under inspection. Viewed from a broader standpoint, however, inspection has its educational side; and it is to the interest alike of the public and of the manufacturer that encouragement should be given to the development and perfecting of technical processes. From the earliest days of administration, Dr. Angus Smith sought to assist the industries under inspection by means of independent study and research in the laboratories of the department; and this wise and enlightened policy has been followed by his successors. Memoranda embodying the results of such research have been a feature of the annual reports for many years past, and have received favourable notice in the Technical Press. As the scope of the work extends and references multiply, it becomes increasingly difficult to keep in touch with what has been done in past years; and much that is of a permanent value is in danger of being buried under a mass of detail that is of temporary interest only. An attempt has been made to supplement the earlier index by means of a Technical Index containing references to the various researches conducted by the department since 1893, together with an appendix embodying some of the methods of analysis which have been elaborated for the solution of the more important problems under consideration. With these are presented certain of the methods employed by Inspectors in the routine work of testing the acidity of chimneys and other exits under the Act, which may be of use to works chemists and others who are engaged in similar work. It is hoped that some of the work to which reference is made in the pages of the index will serve to indicate directions in which further advance may be made in the application of scientific principles to the control of the various processes coming within the purview of the Act.

Mr. Curphey, while pointing out that many workers have co-operated towards the elucidation of the problems dealt with, makes acknowledgment of the fact that the bulk of the analytical work has been contributed by Mr. E. Linder, to whom he is indebted also for the compilation of the index and appendix.

LATE GAS BILLS.

There are two Bills which have been introduced into Parliament since (in January) we reviewed those that were lodged at the regulation time. The two new comers are from the Dover Gas Company and the Swinton and Mexborough Gas Board.

The Dover Gas Company's Bill is in the main a financial one. The present authorized share capital consists of £180,000, of which £100,000 has been issued and fully paid up. There has been received in premiums (omitting shillings and pence) £30,983; and so there remains to be issued £49,016. Borrowing powers have been authorized to the amount of £52,833; and of this there has been borrowed on mortgage and debenture stock £25,124. The Company now ask to be permitted to borrow on mortgage, or by the creation and issue of debenture stock, or partly by either of these means, such sums as, with the aggregate amount raised at the date of the passing of the Act by debenture stock and by mortgage, will make up the sum of £59,824. The powers of borrowing on mortgage, or creating or issuing debenture stock, conferred by the Acts of 1860, 1864, and 1901, so far as they have not been exercised, are to be repealed. The Company ask sanction to the temporary borrowing on the security of any debentures or debenture stock (whether redeemable or irredeemable) issued under the powers possessed or conferred by the present measure. They also desire authority to issue any preference or debenture stock so as to be redeemable. Save as provided, the Company are not to redeem out of revenue any debenture stock or preference stock created under this power; but they may, if they think fit at any time during a period of ten years from the passing of the Act, so redeem, to a total amount not exceeding £10,000, any such stock created and issued for the purpose of defraying abnormal reparation expenditure due to circumstances arising out of the war; and such redemption may be effected either by the payment off of annual instalments of the said sum, or by way of a sinking fund calculated to pay off the same at the expiration of the specified period. Annual meetings are provided for. Repeal is asked to the provisions of section 12 of the Act of 1901 so far as they limit the rate of dividend on the prefer-

ence capital; and authorization is desired to determine the rate of dividend on preference stock at the time of its issue. A calorific power standard of 500 B.Th.U. is proposed, with a minimum pressure of 15-10ths. Power to purchase gas in bulk is also desired. [*Parliamentary Agents: Messrs. R. W. Cooper & Sons.*]

In the preamble of the Swinton and Mexborough Gas Board Bill, it is stated that, in consequence of the large sum awarded to the old Company for its undertaking (under an award made in pursuance of the Act of 1909), the revenue of the undertaking has not been sufficient to meet the expenses and other sums payable by the Board; and a considerable deficiency has in each year arisen which has been defrayed by rates levied on the ratepayers. It is now proposed that the deficiency should be limited. It is also mentioned that, as a result of the recent war, the cost of manufacturing gas has largely increased, and, in order to reduce the cost, the Board are desirous of obtaining a supply of coke-oven or other waste gas from the Manvers Main Colliery or other collieries in the neighbourhood. The clauses provide that the Board and any local authority, company, or person within the limits of supply, and the urban district of Wath-upon-Dearne and the rural district of Rotherham may enter into, and carry into effect, contracts and agreements for the supply to the Board of gas and coke-oven gas for the purpose of their undertaking. Authorization is asked to the laying of the necessary pipes, &c., for the transmission of the gas, as well as to the supply by the Board of coke-oven gas (if they have sufficient) to any local authority or company within whose district the conveying mains have been laid, at a price as nearly as possible the same as is paid by the Board, regard being had to the circumstances under which the gas is supplied. Some general clauses appear, including one asking for power to borrow £2500 for the laying of mains for the supply of coke-oven gas, and the requisite amount for paying the costs of the Act. It is suggested that the periods of repayment shall be respectively thirty years and five years. [*Parliamentary Agents: Messrs. Baker & Sons.*]

WOMEN IN THE GAS INDUSTRY.

One of the papers read at the forty-ninth annual meeting in Boston of the New England Association of Gas Engineers was by Mr. George H. Priest, who quoted various statistics based upon a questionnaire sent out to thirty-eight New England gas undertakings, regarding the employment of women to replace men. By way of introduction, the author said that the experiences of English companies, where employment of women has become a settled thing in practically all departments, might lead to the conclusion that some companies at least on his side of the water might be adopting the same practice; but that this is not the case his figures prove.

To the thirty-eight question papers sent out, thirty replies were received; and it is assumed that the eight who did not answer found the matter of no consequence in their own cases. Of the others, sixteen stated that no women had taken the places of men. Thus, out of thirty-eight of the largest companies, no less than twenty-four have apparently made no changes in this direction. Of the remaining fourteen, only seven have replaced more than four men with women. The maximum number replaced was nine. In no case is retort-house or yard work mentioned. Women have been paid the same wages as men by six companies, and smaller wages by six others. In one of the latter instances, the rate for women was 65 p.ct. of the men's rate. Three companies found that women could not accomplish as much work in the same time; while six others answered that they could.

The report from one town was to the effect that when women were first employed a year ago, after some preliminary training they were put out on house complaint work—such as adjusting stove burners, gas-irons, incandescent burners, and replacing mantles. The results were most satisfactory; their work being done more thoroughly than the men were doing it. They seemed to take more interest in it, possibly because the work was new to them; and many messages have been received from customers that the women had corrected minor defects in appliances which the men had persistently overlooked or neglected.

Analyzing these and other replies, Mr. Priest said it is evident that women have made-good in the office in practically all cases. In several instances they have qualified in the house lighting maintenance and sales departments. In all other directions their employment has apparently been an unimportant factor; and one would infer that, with very few exceptions, the matter will cease to be of interest to the companies when war conditions no longer exert a predominating influence on their operations.

In New York City, women meter readers have been employed extensively, and have given general satisfaction. It has been demonstrated, however, that women under 28 years of age do not possess the necessary qualifications. The Consolidated Gas Company last October were employing hundreds of women, not only as meter-readers, but as gas appliance inspectors, lamp inspectors, saleswomen, bill collectors, clerks, and bookkeepers.

Temporary Increase of Charges Act.—Applications have been made to the Local Government Board by the Burnley Corporation and the Bedwellty Urban District Council for Orders under the Statutory Undertakings (Temporary Increase of Charges) Act.

ELECTRICITY SUPPLY MEMORANDA.

Estimates for new electrical plant are being made public; and electrical engineers are not looking with serenity upon their magnitude. In hitherto making a survey of their trading prospects, they have not been sufficiently generous in capital charge allowances. The truth of the matter is coming home to them with brutal force; for, when total charges are dissected, it is found that those for which capital is responsible, even under the pre-war order of things, represent a percentage which puts altogether into the shade actual generating and distribution expenses. Their proportion is going to be still higher—permanently, as things have shaped; and for work that has to be done immediately at present peak-load costs, immensely higher. Birmingham is going in for a large new generating plant at Nechells; and for this a Local Government Board inquiry was held the other day into an application for a loan of £1,626,140. This is a big sum; and the Engineer has shown that it is about treble what it would have been before the war. As a matter of fact, the cost per kw., based on tenders received, and allowing 20 p.ct. for contingencies (which is a prudent percentage in these times), is £44 per kw., as compared with the pre-war estimate of £15 per kw. for identical work. There is Belfast also wanting a new station. The foundations and buildings before the war it was estimated by Sir John Snell would cost £46,000; and the City Surveyor was then of opinion that they could be carried out for £10,000 less. Now tenders have been obtained for the—mark this!—foundations only; and these are found to range from £120,000 to £170,000. So that it is probable the foundations and buildings, without any equipment, will cost about six times more than the pre-war estimates. These new stations will no doubt generate more cheaply than those in existence before the war. But this will be principally due to the smaller quantity of fuel used—nothing more. This fuel will cost more per ton, labour will cost more, and so will lubricating oil and wear and tear—if only owing to the higher cost of materials and labour. When a dispassionate survey of the position is made, electrical engineers find that their "all-electric" dreams are receding farther and farther from realization. These dreams were of pre-war origin; and what belongs to the past in that way requires revision under the circumstances of the present. With plant on the large scale as at Birmingham, at £44 per kw., electrical energy at a low price does not look brilliantly possible. What of the super-power stations and the distribution works? The electrical industry stands an excellent chance now of seeing its capital shoot-up with magnificent vigour; and the prices charged for energy will have to harmonize. Those engineers will perhaps consider themselves fortunate who have no immediate call upon them for capital expenditure, and who can paddle along until the cable from a super-station passes through or comes near the border of their area.

The Upward Flight of Capital Costs.

What is the Hope for Lower Running Costs?

Apart from capital, those administrators who are anticipating a material reduction of working expenses are, it is feared, misplacing confidence. It is noticed, from remarks made by the Chairman of the Chelsea Electricity Supply Company (Mr. W. R. Davies) at the recent meeting, that he is trying to be hopeful with very little substance to support the feeling. He looks for a larger revenue as soon as the Coal Controller's restrictions are withdrawn; and he anticipates a reduction of oil fuel, and a disappearance of the charge for allowances to employees on military service. He also believes that repairs will become normal again. We are afraid it will not be the old normality; but a new one will have to be established under prevailing conditions. There cannot be any universal raising of wages and shortening of hours—from coal throughout the industries from which the electricity industry (or any other industry) draws its supplies—without affecting not only capital expenditure, but maintenance, repairs, and renewals, and the other items of outgoings. Coal, oil, metals, and manufactured goods will not again fall to pre-war prices under the more onerous conditions; so that electricity generation, installation, upkeep, and everything else will stand at a higher level of cost than before the war. Combined with heavier capital expenditure, prices of current will necessarily have to be at a higher rate than ruled four or five years ago. As progress is made, more units may be generated per ton of fuel used; but the calorific value of the electrical unit is a fixed quantity. The efficiencies of the electric lamp, the electric-oven, and the electric-radiator do not offer much room for improvement. The only hope for some fresh achievement is the hot-plate. And electrical men have for years been trying to raise its efficiency, with disappointing results. The hope that running costs will become substantially lower cannot therefore be of a very firm nature.

"Monstrously Exorbitant."

In these circumstances, of high capital and working costs, the return to the old widely dissimilar charges that obtained per unit for (respectively) light, heat, and power is not very promising. In a comment on Prof. Bone's Cantor Lectures, "Meteor" of the "Electrical Times" remarks that a figure for electric heating like that used in the

Professor's comparison—viz., 1½d. per unit—will look "monstrously exorbitant a few years hence." "Meteor" in the *rôle* of a prophet is admirable; but he is a cautious prophet. Be it noted "a few more years" have to roll before 1½d. per unit for heating will look "monstrously exorbitant." Present conditions will lead most men mentally well balanced to doubt if a heavy electric heating load will ever be taken on in the winter months at profitable charges which will be so diminutive that 1½d. will appear "monstrously exorbitant." Of course, 1½d. is a "monstrously exorbitant" price [some people are being charged 2d. and 2½d.] to pay for 3420 B.Th.U., all of which do not render a useful account of themselves in service. "Meteor" boasts that a year prior to the war "1d. per unit for heating was quite common, and ½d. was not unknown even with our parish pump undertakings." The 1d. was only possible through the kind offices of the lighting units. Scientific calculation—including all factors which the professional men of the industry used to boast were brought in to guide them in their fixing of prices—was cast to the wind in trying to scrape together a little heating business. As to the ½d. per unit, this was as a rule the pendant to a lump sum payment usually based upon something quite foreign to the cost of generating and supplying electrical energy, and was about the crudest piece of invention that an industry vaunting its scientific control could ever have indulged in. But, of course, the industry has been found guilty during the war of much more that is crude—for example, its ill-use of bituminous coal, and the large difference there is between undertakings in the consumption of coal per unit of energy generated.

The Prospects. We have, by the light of the conditions so far as they present themselves, considered the price reductions possible under electric systems on the grand scale. So have many electrical engineers; and they are dubious. "Meteor" himself has in past times indicated that he is not a staunch believer in all that the Power Sub-Committee predicted; nor is he yet satisfied regarding distribution costs. There may be more in some of the "parish pump supply undertakings," as was shown recently when dealing with Mr. David Wilson's data [see "Memoranda" for Feb. 11, p. 266] than "Meteor" himself is now willing to admit with, for the electric industry, some awkward truths permeating men's minds. While it is true that £1 will not purchase from the gas supplier so many heat units as from the coal purveyor, the reason that of the two labour-saving heating agents—gas and electricity—the former will meet the public requirements more economically than electricity, and so always have superior place and force, is because electricity stands so far down the scale of thermal efficiency, and the difference is being made still greater, as was shown in an editorial article on "Twelve Million B.Th.U. per Ton" in last week's "Journal." Our friend also asks, "Do the gas people seriously imagine that they are going to duplicate the electric-mains throughout villages and rural districts with gas-mains for heating only?" The reply is "No." Gas people intend to supply gas there for light, heat, and power. What is more a large proportion of villages and rural districts have already their gas-mains in position; and the question really is, Do the electrical people seriously imagine that they are going to duplicate the gas-mains throughout these villages and rural districts for isolated lighting and intermittent power custom? Doubt exists in many high quarters in the electricity supply industry, despite what our meteoric prophet says.

Muddle at Dundalk. There was recently a little liveliness at one of the meetings of the Dundalk District Council. The inquiry that Dr. P. C. Cowan, of the Local Government Board for Ireland, held in the town in 1911 is well remembered. We recollect, too, that all in the electrical garden of Dundalk was going to be lovely, according to those who advocated—councillors who knew nothing about the risks of electricity supply, let alone its technicalities—the setting-up of an electricity system. We have in mind, too, the predictions of Mr. George Airth, the Engineer and Manager of the Gas Company. These were contemptuously kicked aside as being of no value. The truth is now before us. Mr. Airth's predictions have largely matured; those of the advocates of the electricity station have not. The public do not seem to have been very well informed as to the "rake's progress" of their electricity concern. There has been a fondness for the secrecy of discussion in Committee over the electrical financial position; but at the meeting of the Council the proceedings at which are before us the position was dragged out of obscurity, and gave critics and defenders an opportunity of comparing their individual intelligences and making thrusts at each other's statistical capacities. Incidentally, too, Mr. M'Coy (whose name without the "Mac" would have suggested a gentle, reserved, and courteous nature) referred to "the pleasing of the Scotchman Mr. Airth, and this Orange Company, the gas-house fellows." The same gentleman admitted that the Gas Company is a paying concern; while he would have preferred that the financial position of the electricity undertaking had been "discussed below in Committee." There was talk of an overdraft at the Bank of £2000; a letter from the Local Government Board relative to it; and the County Council communicated with the Council *re* the balance of last year's demands amounting to £3349. But of capital importance is an explanation by the Town Clerk that, up to March 31, there was £7798 due to the general account of the Council by the Electricity Department for sinking fund and interest. The rates, it also appears, were put up by 1s. 6d. last year. But nobody seems to know with certainty whether or not this was for the electricity concern. At any rate, we do not trace any indication that the electricity concern received any help from the 1s. 6d. If it did, then the position is worse than was anticipated. The gas undertaking is a paying concern; the electricity concern admittedly is not, seeing that sinking fund and interest must be satisfied before the concern is out of debt, besides which provision should also be made for depreciation. These things all being admitted, then we know where in Dundalk to put our hands on business capacity and on pitiful business muddle. It is as well the public should have been placed in a position to form judgment; and the same public will now remember the pretty pictures that were presented to them in 1911 as to what electricity would accomplish in the hands of the District Council. Those councillors who believe in being honest and straightforward with the public will not be parties to these matters being kept concealed.

Money! Sir Leo Chiozza Money has joined that little army of visionaries who see an unlimited quantity of wealth coming to us from coal if only we will confide its destinies to electricity. He completely disclosed his ignorance of the subject in an article that he contributed to the "Sunday Chronicle" recently, and to which Mr. Wilfred Drake called attention in our Correspondence columns on April 8. We do not object to Sir Leo condemning the fearful waste of the wealth of the country by the crude use of coal on the domestic hearth; and he can even accuse the majority of steam-raising plants of being incredibly bad. But we do object to him trading on pure hypotheses, and writing of electricity as though it showed the highest possible efficiency in the use of coal, and that there is nothing in existence that can better its performances. There is no need for the majority of steam-raising plants being incredibly bad. As a matter of fact, the electricity stations, with few exceptions, use steam-boilers; and by the time they have generated electricity they have, the best of the plants, only realized about 10 p.ct. thermal efficiency, which is worse than the modern coal fire, which can boast of about 20 p.ct. The average thermal efficiency of the generating stations of this country is only between 5 and 6 p.ct.; and the electrical claimants as to the possibilities vary their predictions from 13 to 20 p.ct. What has Sir Leo to say to these incontrovertible facts? A far greater efficiency than can ever be attained by electricity in heating operations is procurable by using gas direct as it is produced from coal. Every scientist who has studied this matter knows that Sir Leo is writing what is a crass absurdity when he says that, "by the all-electric way, we can conserve our coal, making 1 ton perform in work what more than 2 tons perform by our present clumsy methods." He refers to the "little" electric plants that have been set up, encouraged by our unscientific legislators. Some electrical plants in the country cannot be properly described as "little;" and all of them—large and small—have been the product of the brain of some electrical expert. Yet Sir Leo speaks of "our electrical undertakings presenting to the engineer a study in human folly beyond the power of words to exaggerate." When he speaks of "unscientific legislators," we can easily convict him from his own pen of being one of them, so far as electrical generation is concerned. We will not pursue the article further, except to say that Sir Leo believes that the all-electric scheme, by supplying cheap and convenient power to producers, would so enlarge our industries as to give us by 1940 a national income of over £5,000,000,000 a year. For the sake of the nation, we hope there is better ground for this declaration than for some of the other statements in the article. Never in their dreams have men of the electrical world pictured anything like this as representing the money potentiality of their industry.

THE AMERICAN GAS ASSOCIATION.

Address by the President (the Hon. George B. Cortelyou).

[Delivered at the Informal Conference, held March 13 and 14, in New York City.]

This conference meets at a time of world-wide reconstruction and readjustment. History records no other similar period, either in the diversity of its aspects or in the magnitude of its problems. Nations and groups and individuals find themselves in radically new relations. Mankind is to measure results primarily by the yardstick of service and not of self-interest, by what we give rather than what we get in our labours. But the fact must not be lost sight of that self-interest, properly directed, has ever been one of the guide-posts along the pathway to ordered liberty, and no scheme of government, or business, or society will be found suited to human affairs that unduly subordinates it either in international relations or in the daily life of the people.

How to obtain a nice balance of these elements in government and business, to foster and safeguard among men the priceless rights of "life, liberty, and the pursuit of happiness," as we in America pronounce them, is engaging the best thought of the best minds of our time.

Lessons of the Past.

I speak this morning, therefore, not of the past, save in necessary reference, but of the present and future of the gas industry.

Its history has been recorded in many books, and in many tongues. To a body of gas men as representative as this to define its outlines, to recount the periods that mark its greater achievements, would be to recall only that to which you all have ready access. So our purpose, while paying a tribute of unbounded respect and appreciation to the builders and workers through whose genius and devotion the industry has grown to its present world-wide dimensions, is to look ahead, and to bring home to ourselves and to all who serve it a realization that what is past is but the foundation upon which we must build, broadly and securely, for the future.

War-Time Participation.

Inspiring, indeed, is the report I make to you of the industry's part in the great war; and that is so recent and so important that, in referring to it for a moment, I am not deviating from the announced outline of these remarks. Where all did so splendidly, it is not possible to single-out anyone for special mention. It is no exaggeration to say that the war could not have been successfully carried on without the aid of the gas industry; and the industry, in the language of the day, made-good. It more than made good. It met a great emergency promptly, and with high efficiency. It supported the Government and all the forces of liberty and civilization; and many of those who magnify its occasional shortcomings might well search their own hearts for a sign of similar patriotic service.

In addition to this indispensable element in the manufacture of high explosives, furnished in large quantity by the gas companies of the country, substantially all the carbon which was used for the gas defence of the United States forces, and for a considerable portion of the Allied forces, was produced at one company's plants. In innumerable other ways, locally and nationally, the industry played its great part. One company reports that 1500 of its employees entered the service of the United States during the war; another, 1146; another, 1072; another, 637. Still another reports that, out of a total of fifty employees, sixteen went into the service. And as they return to us they are welcomed back to the places they left. Their influence will be a vitalizing force in our industry; and hallowed for all time will be the memory of those others from our ranks who made the great sacrifice.

The whole record is typical. It was so throughout the land, in all lines of business. How creditable it is to American business, and how gratifying it is that our industry, helpful and patriotic in every previous emergency in its history, should have met this supreme test so finely and so completely!

Work of the Association.

Now as to the Association. Its work is rapidly nearing complete organization. For the first few months as much was done towards this end as was possible with so many of our men in the service, and with restrictions put upon our activities by the imperative requirements of the Government. The foundation was laid, however, and upon it we have built. Since the signing of the armistice, the men have been returning, restrictions have been lifted, and the Association is assuming more and more the duties which you expected of it. Its sections and committees are busy; its literature is reaching you in greater volume and substance; its relations with other organizations are being thoroughly established. Its Executive Board and officials are devoting time and energy to its affairs; and I feel that I am justified in assuring you that the work you entrusted to them is having their earnest thought and attention.

It is the weakness of many Associations that they appear to lay the emphasis upon the multitude of their activities, with an accompanying large expenditure of money, rather than upon concrete accomplishments. It is all-important that this Association should do a few things well, rather than attempt too much and do it all indifferently. But we must have a wide-awake organization, appealing to the interest and enthusiasm of the entire membership; open and frank discussions in our meetings; thorough co-operation between sections and committees and the membership generally; and animating all our activities the spirit that was revealed "over there" in the historic remark of a French to an American officer: "Your men are trained to go in only one direction, and that is forward."

At the present time, the membership consists of:

Holding companies	9
Gas companies	264
Manufacturer companies	92
Individual members (active)	1401

The gas company membership represents approximately 60 p.ct. of the total volume of gas business done in the United States. An active campaign is under-way to enlist the co-operation and support of every gas company and manufacturer of gas appliance, equipment, and supplies in the country, in order to make the Association a truly national one and 100 p.ct. representative of the industry. The Association is more than national in scope. Our Canadian brothers are members; and as its influence grows, others will join us, to share in the great advantages that come from union in a common interest and a common cause.

Sections and Their Work.

Of the work of the sections, I need not speak at length. You are, at least in a measure, familiar with it. As new needs present themselves, new sections can be formed. The Association must never become hidebound to any immutable programme. It must be flexible to be useful. It must be receptive to new ideas. It must reach the least as well as the greatest of companies, co-operating with all impartially, and lending its facilities at all points to the individual striving to advance himself; for in the help and encouragement it affords the employee, especially if he or she be among the younger and less conspicuous, it is building for the future of the industry and the progress and contentment of its entire personnel.

Each section should develop into a great national organization, allied to the central body by those provisions of our constitution and bye-laws essential to successful unified effort. The sections are planned on this basis. The responsibility for accomplishment should be eagerly accepted by them; and under the guidance of the Executive Board the results should be of a gratifying and lasting character. Gas should not yield the field to any rival. It should contest in the open for business, and should encourage inventive genius and chemical and engineering research by every means within its power. In this way only can the rich field of possibility be fully cultivated.

As further indicating the steps that have already been taken to perfect the organization, the general and sectional committees appointed, and now actively engaged, are:

General committees	15
Commercial section committees	7
Technical section committees	8
Manufacturers' section committees	3
Accounting section committees	3

General Relations.

Our means of contact with the Federal Government at Washington, on the larger aspects of the situation created by the war, were the two important bodies—the National Committee on Gas and Electric Service, Mr. John W. Lieb, jun., Chairman, and the National Committee on Public Utility Conditions, Mr. Philip H. Gadsden, Chairman. The former Committee acted for the utilities in placing their resources and facilities at the disposal of the Government; the latter represented and safeguarded their financial interests. These two National Committees discharged their duties in a conspicuously able manner.

In conformity with the policy of establishing close relations with State and District Gas Associations, affiliation agreements have been drafted which will be submitted to both these Associations for ratification. The New England Association of Gas Engineers has already voted to affiliate with us. The Association will have a representative in attendance at the annual meetings of all the State and District Associations, whether affiliated with us or not. Special committees have been appointed for our representation in the Chamber of Commerce of the United States, and at the annual convention of the National Association of Railway and Utility Commissioners. In this way we are prepared to keep in contact with the large national problems in which we are interested.

The vitally important question of rates, and, intimately connected with it, that of the cost of materials—oil, coal, and others; the ever-mounting burden of taxation; and our relations with all forms of skilled and unskilled labour—these to-day stand out from among the many problems confronting the utility manager. We must by sane and helpful discussion and action assist him to a wise solution.

Relations with the Public.

In many instances it is partly our own fault if the public misunderstands us. A utility company often adds to its embarrassment by allowing itself to be jockeyed into a position of unpopularity, due to the exigencies of local politics or other similar influences.

Appeal for Increased Activity.

And so my appeal to-day is for renewed energy and enterprise; for the pioneer spirit in research; for engineering efficiency in plants and workshops; for frankness and courtesy and progressiveness in commercial departments; for study of accounting methods—to the end, among others, that the commissions and other public bodies who regulate our business may recognize the waste involved in many unnecessary requirements, and in all the paraphernalia of the pigeon-hole; for co-operation with the manufacturers of our appliances and those who furnish our supplies; and, finally, for a publicity beneficial alike to the industry and to the public.

The war has taught us many lessons. One of them is that success in great undertakings depends not upon the efforts of a few, however strong these may be, but upon the co-operation of the many, whose combined strength far exceeds that of any small, though relatively powerful, group. So in our own industry, every member must do his part if we are to measure up to the opportunities that invite and challenge our best endeavours. But if all work together for the things that serve the general good, there is practically no limit to what may be accomplished.

Who can measure the progress of the gas industry in the next decade, if vision and foresight be characteristic of its leaders of to-day?

Benzol Output in Spain.—The annual output of benzol in Spain before the war is said to have been 1150 tons; but since then several new plants have been installed, and the 1918 output is estimated at nearly 2000 tons.

INSTALLATION AND WORKING OF LARGE HORIZONTAL GAS-ENGINES.

By H. Pilling, of Manchester.

In their issue dated the 11th inst., the "Iron and Coal Trades Review" published an abstract of a paper (of which we are now able to give the text) read on the 7th inst. at a meeting of the Cleveland Institution of Engineers.

It is an interesting matter for speculation to consider what would have happened if the recent four years of war had brought about an imperative and sustained demand for large gas-engines as war weapons. In other words, suppose the course of the war had made it an absolute necessity to concentrate all the best technical and practical skill of the engineers of the world on the single object of producing in one working cylinder horse powers of a thousand and multiples upwards to the highest possible limit. Judging by the feats accomplished in other directions, it is certain that marvellous progress would have been made. Even without this special impetus, a great advance has been effected during the last ten years in matters of detail; and as a result the safety and reliability of large gas-engines working with blast-furnace gas, have been placed on an unassailable footing. It is known that:

(*a*) Blast-furnace gas-engines produce each B.H.P. at a cost of about 10,000 B.Th.U.

(*b*) This low consumption cannot be equalled by any existing steam-engine or turbine.

(*c*) A modern economical condensing steam-engine using 11½ lbs. of superheated steam per B.H.P.-hour requires approximately 23,000 B.Th.U. in the coal or blast-furnace gas fed to the boilers. The boiler plant efficiency is thus 63 p.ct.

(*d*) A modern turbine of very large size requires about 11 lbs. of high superheated, high-pressure steam per KW.-hour, or (say) 15,500 B.Th.U. per B.H.P. per hour in gas or coal; and smaller turbines, 17,000 to 23,000 B.Th.U.

(*e*) This marked economy of the gas-engine, though accompanied by larger initial cost and considerable upkeep and maintenance expenditure is, nevertheless, so great as to make the annual expenses balance-sheet of the large gas-engine more favourable than that of any other class of plant.

As an example, take the case of a blast-furnace installation producing 2000 tons of iron per week, and therefore gas at the rate of (say) 37,000 c.ft. per minute. Of this, about 45 p.ct. is used in the stoves or lost—leaving available for blowing and power purposes 20,700 c.ft. a minute of (say) 105 B.Th.U. per c.ft. at 60° Fahr., and 30 in. barometer, dry. [For the basis of this calculation, see the Appendix.]

Such a plant would produce power as follows:

(*a*) Air Blowing (30,800 c.ft. air per minute at (say) 10 lbs. pressure. This is a first charge on the gas.

	Gas Engines.	Turbine Blowers.	Uniflow Engines.
Brake-horse-power required	1,360	1,700	1,360
Gas consumed per B.H.P.-hour at 105 B.Th.U. per c.ft.	95	230	220
Total gas per minute for blowers. c.ft.	2,150	6,500	5,000
Gas available for power per minute . . . . . c.ft.	18,550	14,200	15,700

(*b*) Electric Generators (after providing for blowing):

	Gas Engines.	Medium-Large Turbines.
Gas consumed per KW.-hour. . . c.ft.	145	235
Total KW. theoretically available . . .	7,700	3,600
Actual KW. sold—assuming 80 p.ct. sale factor	6,160	2,880

It will be noted from the above that for an output of 2000 tons of iron per week, and after providing for the necessary blowing, there would be a large surplus of gas available for producing electric power to the extent stated. The respective generator savings may be given a monetary value by assuming the electric current as worth to-day an average sum of 5d. per unit. Thus, with 2000 tons of iron produced per week, a gas-engine installation would save, or render available for sale, current to the yearly value of:

(*a*) £112,400 for a complete gas-engine installation.

(*b*) £52,600 for a steam-boiler and turbine installation.

The margin in favour of the gas-engine installation over turbines is, therefore, at the rate of £60,000 per annum. What proportion of this saving would be used-up to cover interest and depreciation charges on the extra capital expenditure of a gas-engine installation and to cover the increased maintenance charge, it is impossible in the present state of the market to say definitely. But assuming the difference in capital cost at to-day's war prices for the 7700 KW. gas-engine installation and the 3600 KW. turbine installation, and assuming that 20 p.ct. spare plant costs approximately £260,000, then 10 p.ct. for sinking fund and depreciation charges would account for £26,000. This leaves £34,000 for maintenance and extra profit. It is submitted that the extra maintenance of the installation would use about £9000; and the net profit would therefore be £25,000 per annum.

There is also a most important matter to be considered: Gas-engines require only 0·7 gallon of cooling water per B.H.P. per hour; whereas for boiler-feed and steam-condensing purposes 40 to 50 gallons per B.H.P. per hour are required. This fact alone is frequently sufficient to make the adoption of gas-plant almost imperative.

To utilize the available gas in the case cited would require a gas-power station containing (say) eight "T.13" gas-engines—two being blowing engines and six generating engines—and the house being complete with a 40-ton crane and complete piping system, air compressors, and air receivers for starting purposes, duplicated centrifugal pumps for the piston rod cooling service, duplicated low-pressure pumps for the low-pressure cylinder cooling service, and for lifting the discharged warm water to the top of the cooling towers. Such a house would be approximately 300 ft. by 100 ft.; and of the eight engines two would be spares—*i.e.*, one blowing engine and one generating engine.

Abstract of Gas-Engine Specification.

A brief specification of the engines would be as follows: "T.13" gas-blowing engine—horizontal double-acting four-cycle type, with two gas cylinders and one air cylinder working in tandem on to one crank-pin.

"T.13" Gas-Blowing-Engine.

Gas cylinder diameter	1150 mm.
Air cylinder diameter	to suit air pressure.
Stroke.	1300 mm.
Maximum blowing speed	85 r.p.m.
B.H.P. at rated output	1690.
Free air per minute at 10 lbs. pressure . .	38,000 c.ft.
" " 12 lbs. " . .	33,500 "
" " 14 lbs. " . .	30,000 "
Approximate range of working speed . . .	30 to 85 r.p.m.
Net heat consumption per B.H.P. per hour at rated load	10,000 B.Th.U.
Net heat value of dry blast-furnace gas at 60° Fahr. and 30 in. bar.	105 B.Th.U.
Gas consumption per B.H.P. per hour. . .	95 c.ft.
Oil per 24 hours at 85 R.P.M., about . . .	8 to 9 gallons.

"T.13" Gas-Power Engine.

Gas cylinder, diameter	1·150 mm.
Stroke	1·300 mm.
Speed	94 R.P.M.
Normal continuous load	1850 B.H.P.
Maximum continuous load	2000 B.H.P.
Maximum momentary load	2200 B.H.P.
Oil consumption in 24 hours, about . . .	10 gallons.
Cooling water consumption, per B.H.P., per hour, based on maximum load, at 60° Fahr., about	7 gallons.
Heat consumption at normal full load per B.H.P. per hour, about	10,000 B.Th.U.
Heat consumption at three-quarters load, about	11,000 B.Th.U.
Cyclic irregularity for driving "D.C." dynamo	1/150
" " " "A.C." generator	1/250
G.D.² for "D.C." dynamo	1,350,000 kg.m.²
" " "A.C." generator	2,250,000 kg.m.²
Crane required to lift gas cylinder, about . .	26 to 27 tons
Compressed air for starting	220 lbs. per sq. in.
Gas per KW. hour at average loading . . .	145 c.ft.

Next let us assume that the plant is completely installed and that instructions are required to the staff engineers for the working of the plant. Such instructions for starting and working the engines might be as follows:

Starting Instructions.

In brief, the method of starting is as follows:

1. Bar the engine round until the crank is about 30° over the back dead-centre (8 p.ct. of the stroke), and No. 2 cam (back end of the front cylinder) is just pointing below the horizontal, and away from the engine.

2. The stop-valves on the gas cylinders are closed; the stop-valve in the gas-main is opened; and any air in the gas reservoirs and pipes is got rid of through the air-clearing pipe.

3. The oil-reservoir on the engine-bed is filled up; the oil-tanks filled; and lubrication generally attended to. All water services are turned on.

4. Set the ignition gear for starting to about 5 p.ct. or (say) 25° before the dead-centre. When under-way, advance to from 10 to 15 p.ct.—say 35°-45°—before the dead-centre, according to the engine speed and quality of gas.

5. Close the main switch on the ignition board, and also the switches to the front cylinder. Open the switches to the cylinder taking compressed air (the back cylinder).

6. Turn the compressed air on to one (the back) cylinder; and immediately the engine has started to move, but not before, open the gas stop-valve, on the front cylinder about one turn from the edge and edge position, or two turns of a sluice-valve. This cylinder should now fire, and the engine gathering speed.

7. Cut out the compressed air on the back cylinder, and screw-down the air-valves on it; close the ignition switches to this cylinder; and open the gas stop-valve about two turns.

8. As the engine gathers speed, gradually open-out the gas stop-valves until the governor rises and partially closes the gas throttle-valves. The engine is now ready to be put on load.

9. If a gas blowing-engine, the air control-valves under the blowing cylinder must be fully opened before turning on the compressed air to the gas cylinder.

10. When the engine is under-way, open the valve in the cold blast-air main from the air cylinder; and then slowly close the control valves under the cylinder.

11. To bring the engine up to speed, open the gas and air throttle valves by means of the hand-wheel control; at the same time opening-out the gas stop-valves in the cylinders.

12. When the engine is away, close the compressed-air stop-valves and screw-down the air starting-valves on the cylinders, if there has not been time to do this earlier—as paragraph 7.

Working Instructions.

1. The gas must be entirely free from suspended moisture, and should contain not more than 0·01 gramme of dust per cubic metre. It should contain no measurable quantity of tar. The temperature should not exceed 70° Fahr.

2. Cooling water to be soft and free from acids, and reasonably free from suspended impurities. The temperature should not exceed 80° Fahr. in the summer.

3. Lubricating oil should be of the best quality for this class of work; and in particular it should leave no carbonaceous deposits, and produce no sludge when circulated through the engine.

4. All water jackets should be washed-out periodically, at intervals of from two to six months, according to the quality of the water and the jacket in question.

5. Stuffing-boxes should be cleaned periodically, at intervals of one to six months, according to the design of the boxes and the quality of the oil and the gas.

6. The ignition plugs should be cleaned or renewed periodically every four to twelve weeks, according to circumstances.

7. The engine should be internally and externally inspected throughout about every six months. After experience has been gained, this period can often be increased to twelve months; but the first period should never exceed six months.

8. The water temperatures should be taken once a day or once a week as circumstances dictate. The outlet temperature of the water should never exceed 150° Fahr., and preferably should be kept down below 120° Fahr. In the case of dirty waters, put plenty of water through at low temperature.

9. Take occasional light-spring and main-spring diagrams.

10. Adjust the ignition timing so as to give a nicely round explosion peak on the indicator card.

11. The cylinders fire in the order 4, 3, 2, 1—No. 4 end being the rear and No. 1 the front.

Internal Examination of Cylinder.

Next we will consider the best method of complying with the instructions *re* inspection. The most difficult feature of the inspection would be the internal examination of the cylinder. In general proceed as follows:

1. Disconnect the piston-rod couplings and the main cross-head. Remove the stuffing-boxes and cylinder covers 4 and 1.

2. Take out the pistons and rods, the back piston going through the back cylinder, and the front piston through the front cylinder (or the back cylinder if preferred).

3. Lower and remove the exhaust valves and seats (inner casings).

4. Remove the inlet valves and inner casings.

5. Remove the gas and air throttle valves.

6. Test the water discharge pipes for being clear, by means of wires.

7. Clean out the oil-filter and the oil-pipes.

8. Remove and clean the air-valves on the blowing cylinder.

9. Open-up and clean the gas piping and reservoir.

10. Open-out and clean the exhaust piping and expansion joints.

Possible Results.

Now that the inspection is over let us tabulate the possible results—bearing in mind that the rate of gas-engine wear depends upon: (1) Quality of material; (2) lubrication; (3) cleanliness of gas and air; (4) alignment of engine; (5) finish of parts.

Data have been kindly supplied by a number of firms, and the following information will be found to convey the actual amount of wear and tear noted by firms who have had several years' experience with large gas-engines of the horizontal type. It may be remarked that the engines have not included many improvements recently effected.

Cylinders.

Firm A.—About 0·03 in. of wear per year on diameter (at the worst point).
Firm B.—About 0·15 in. per year.
Firm C.—About 0·04 in. per year. Re-bore after seven years.
Firm D.—Been running up to nine years without re-boring.
Firm E.—About 0·02 in. per year.
Firm F.—Average wear 0·03 in. per year. Liners last five years before requiring re-boring or renewing.

Pistons.

Firm A.—Require renewing after four to five years, owing to ring grooves becoming too wide.
Firm B.—Indefinite life. (Cast-iron pistons of medium size.)
Firm C.—Cast steel, same experience as Firm A. Life of cast-iron piston (old type) uncertain; average fifteen months.
Firm D.—Indefinite life. (Cast iron.)
Firm E.—No sign of failures after one year.
Firm F.—Average life three years; but improved pistons have so far shown no signs of failing. All pistons of cast iron.

Piston Rods.

Firm B.—Re-turn after six years. Wear about 0·04 to 0·05 in. per year. (Measured on diameter.)
Firm C.—Life six to eight years. Wear 0·06 in. per year.
Firm D.—Mostly not yet re-turned after eight to ten years.
Firm F.—Wear about 0·01 to 0·02 in. per year.

Piston Rings.

Firm B.—Life one-and-a-half to two years. Wear 0·25 in. of thickness per year.
Firm C.—Life one-and-a-half years.
Firm D.—Life several years.
Firm E.—Wear about 0·03 in. of thickness per year.
Firm F.—Life nine months.

Stuffing-Box Rings.

Firm B.—Life four to five years.
Firm F.—Life very variable; anything up to two years. Depends on condition of piston-rod. Hot piston-rod generally destroys the packing.

Gas-Engine Cleaning Practice.

Firm B.—Wash-out cylinder, cylinder cover, and exhaust inner casing jackets every three months. General internal inspection every six months.
Firm C.—Wash-out cylinder jackets every six months.
Clean stuffing-boxes every four to six weeks.
Attend to ignition plugs every four to six weeks.
General inspection every twelve months.
Firm D.—Wash-out cylinder jackets every three months.
Clean exhaust-valve seats every six months.
Clean inlet-valve boxes every five to six months.
Clean stuffing-boxes every nine to twelve months.
Firm F.—Wash-out cylinder jackets and cylinder cover every ten to twelve weeks.
Clean exhaust-valve seat jackets about every four weeks.
Clean inlet valves every eight to nine weeks.
Clean governor gas-valves and hand regulating valves every four to five weeks.
Clean gas stop-valves on cylinders every eight to ten weeks.

Summary of Replies, re Gas-Engine Troubles.

Large Engines.

Firm A.—Fracture of piston rods at couplings, due probably to misalignment.
Leakage of water from piston-rods past internal fittings.
No other troubles.

Medium Engines.

Firm B.—Exhaust valves were at first water-cooled and troublesome. Not water-cooled now, and are satisfactory.
Cylinders of single-piece design fractured. Cover and exhaust-valve boxes fractured, due to defective castings.
Materials must be of the best. Gas must be clean, and free from tar and dust.

Medium and Large Engines.

Firm C.—Cylinders (built up); no troubles. Pistons cracked. New designs have effected improvement.
Stuffing-boxes.—Old type gave much trouble with hot rods. New design gives no trouble, and runs much longer without cleaning.
Exhaust-valve seats and boxes.—Trouble experienced with the joint of the seat to the cylinder of the old design.
Firm D.—Exhaust-pipe fractures due to undue rigidity and unequal expansion.
Firm E.—Exhaust-pipe fractures as Firm D. New type ready, but not yet at work.
Firm F.—Troubles generally due to the heating-up of the piston-rods in the stuffing-boxes.
No serious difficulties experienced.

The statements and data given above indicate that during the past decade, when the general status in respect of improved manufacture had not attained to the high point prevailing to-day, even such maintenance charges as are indicated by the returns do not seriously reduce the dividend-earning capacity of a gas-engine installation.

Dividing the responsibility of upkeep between the makers and the users of the engine, the position is as follows:

The makers are responsible for:

(*a*) The general design and suitability of the engine as a whole.
(*b*) The materials used in the manufacture of the engine.
(*c*) The workmanship used in the engine.
(*d*) The erection of the engine.

In respect of workmanship, particular care requires to be paid, and the utmost degree of perfection attained, to ensure the absolute dead-alignment and squareness of the crankshaft with the engine, and of the cylinders and various guides. In particular, the piston-rods and cross-heads must be axially perfectly true with each other and with the cylinders in which they work.

The users of the engine are responsible for :—

(*a*) Providing clean gas at the right temperature. (Hot or dusty gas should be unthinkable.)
(*b*) Good soft water. This should be regular in quantity, and at a satisfactory temperature.
(*c*) Lubricating oil, regular and of right quality and quantity.
(*d*) Systematic cleaning of gas-pipes and water-jackets.
(*e*) Systematic inspection and cleaning of cylinders and valves to remove dirt, carbon, and other deposits.
(*f*) Proper maintenance of spare parts, ignition plugs, spare exhaust valves, piston-rings, piston-rod packing rings, and such other details as are necessary to secure the requisite continuity of operation.
(*g*) Closing-up brasses, preventing knocking, and in particular maintaining true alignment of the piston-rods, in the event of the slide-blocks wearing or the foundations settling.

Touching on the above, the degree of cleanliness in the gas is of the very first importance. It is quite easy to-day to obtain a degree of cleanliness of 0·01 gramme of dust per cubic metre of gas; but in the near future it is highly probable that even this amount of dust will be regarded as disagreeably high. Clean gas, however, should be accompanied by equally clean air; and attention can be profitably directed to providing facilities for cleaning the air for the gas-cylinders and blowing cylinders.

As regards water, if the water is not pure and soft, an artificial water-softening plant is as much a necessity as it would be in a steam installation.

Considerable information is, of course, already available on much of the preceding subject matter; and it is foreign to the purpose of the present paper to discuss in detail questions of capital expenditure, total annual running costs obtainable with each particular type of plant, and so forth.

The main object of the present paper is to state, and doubly repeat, that progress in gas-engine manufacture has been during the past decade, and is now, rapid; and at the present time a state of affairs has been brought about which enables gas-engines to compete on better terms than ever before with all rival systems of power production when the use of blast-furnace gas is found to be available.

To emphasize this point, I would now mention some of the special features which had been developed or introduced in recent years.

(*a*) Adoption of built-up cylinder, with liners to eliminate casting and expansion stresses.
(*b*) New method of fitting the piston-rod whereby the position of the piston on the rod is adjustable. This is of great value when dealing with spare parts, inasmuch as any spare piston or rod can be accurately fitted in position so that the piston-rings come exactly to the edge of the bell-mouth in each case, although the cylinder dimensions may not in each case exactly coincide.
(*c*) New type of piston-rod packing, whereby the whole packing is much more accessible for cleaning, overhaul, inspection, and repair, without the necessity of removing same from the rod.
(*d*) New type of exhaust valve-box, with renewable valve-seat, and also special arrangements for detecting any leakage between the exhaust valve-box and the cylinder body. This is calculated to save in many cases the renewal of a cylinder.
(*e*) New arrangement of exhaust pipe and new design of expansion joint, with a view to avoiding fracture.
(*f*) New type of piston, free from bending stresses. With this type of piston, the liability to fracture due to bending stresses is greatly reduced.
(*g*) New frictionless air-valve for the blowing cylinder. This valve is superior to certain well-known German valves.
(*h*) Improved arrangement of powerful servo-motor governor for the electric generating engines.
(*i*) New arrangement of ignition switch-board, with visible indication of correct functioning of all igniters.
(*j*) Improved and simplified inlet-valve arrangement.

Conservation of Fuel.

In conclusion, I wish to make a few remarks on the question of the conservation of fuel. The Report of the Royal Commission on the "Conservation of the Coal Supplies of Great Britain" indicates a probability that legislation will in the near future lay heavy penalties (and possibly an absolute veto) on the use of wasteful engines and boilers.

There are, however, to-day large numbers of power users, possessors of out-of-date inefficient plant, who, obtaining a fair or good return from their businesses, have continued to use power plants which have been a disgrace and an everlasting shame to their owners and to the country and government which continue to allow such wasteful depletion of their coal resources. Why to-day should any man (whether his business be profitable or not) be permitted to go on using, as thousands of firms producing millions of horse power are doing at this moment, engines which use double, quadruple, aye thirty-fold the amount of steam and coal which suffice a modern equipment.

To-day in the rolling mills of South Wales, the Black Country, the North of England, and Scotland, there are amazing cases of engines of 30 to 60 years of age using in the most wasteful manner from 60 to 200 lbs. of steam per H.P.-hour. Compare this with the 9 to 15 lbs. required to-day for modern plants even of the smallest sizes. In terms of coal, the former plants, with lamentable boilers to correspond, use about 12 to 40 lbs. of coal per H.P.-hour, as against 1½ to 2 lbs. for a modern installation. Also there are many cases of blast-furnaces which are not equipped for the economical utilization of blast-furnace gas. Many thousand KW. are thus wasted; and, in lieu thereof, coal-burning generating plant has in some form or other to be installed. Comment seems to be quite superfluous. It is action and a veto which are required.

Consequently, it is suggested in the case of large installations like iron and steel works, and wherever blast-furnace gas is available, that the considerations outlined in this paper should not be laid aside before careful thought has been given to the subject. The trend of modern experience is definitely in the direction of the most complete utilization of any source of heat supply, even at the cost of increased capital expenditure.

Appendix.

A cubic foot of dry blast-furnace gas (Cleveland practice) has a net heat value of about 105 B.Th.U. per cubic foot at 60° Fahr. and 30 in. bar.

Each ton of pig iron requires (Cleveland practice) 155,000 c.ft. of air, and gives 190,000 c.ft. of gas—all measured at 60° Fahr. and 30 in. bar.

The average boiler plant efficiency is taken as 63 p.ct., including all losses.

To blow 1000 c.ft. of free air per minute against a pressure of 10 lbs per sq. in. takes 44·2 B.H.P. in a reciprocating blower, or 55 B.H.P. in a turbo-blower.

The capital outlay (land and coal storage excluded) is £40 per KW. for a gas installation; £25 per KW. for turbines. Spares should equal 20 p.ct. of the working plant.

WAR-TIME OIL PROBLEMS.

Some time before the war, it fell to the lot of Sir Frederick Black, K.C.B., to go into statistics and estimates of oil production and consumption all over the world, not merely at the moment, but for a specified term of years ahead. He explained, however, in an address delivered by him last week as President of the Institution of Petroleum Technologists, that estimates of possible petroleum requirements which were formed before the war were far exceeded by the actual needs of the stupendous struggle. It was not only a question of increased quantities that had to be dealt with, but the fact that these increases were not in uniform proportions of the various products. Consequently, difficulties of refinery adjustments, as well as of production and transportation, had to be met. Among the main problems were: (1) Whether the world could produce the aggregate supplies that were required for the service of the war. (2) Whether the processes of refining could be so adjusted that the increased quantities of heavy fuel could be obtained, as well as those of petrol or gasoline. The use of toluol-benzene extracted from Borneo oil was a valuable addition to our supply of high explosives. From the latter part of 1916, the Ministry of Munitions and the Admiralty, under able advice, had given special attention to the home production of oil from shale and cannel coal. In the then state of knowledge and development of processes of high-temperature and low-temperature distillation, there was necessarily much room for doubt and diverse opinions, both as to the best systems of distillation and as to the resources of cannel. The line of immediate progress was found to be the use of retorting facilities at some of the existing gas-works of the country. Much useful work, the President said, was done; and though in time of peace the home production will have special difficulties to contend against, it need not be doubted that home production of oil from cannel and other coal will sooner or later be one of the sources of supply the market will need.

Manager to the National Gas Council.

We congratulate Mr. Edward J. Fottrell, B.Sc. (Leeds), Assoc. M.Inst.C.E., upon his appointment to the responsible position of Manager of the National Gas Council. Mr. Fottrell has had a varied experience in, and associated with, the gas industry. All personal gifts and experience that he possesses, we may be sure, will have full scope offered them in connection with the work of the Council. Before the war, Mr. Fottrell was Distributing Engineer to the Wandsworth, Wimbledon, and Epsom District Gas Company. This office he resigned in order to join the Royal Engineers. He was at the War Office for some time, but left there, at the request of the Ministry of Munitions, in order to act as Technical Adviser on Ammonia Conservation. Following this, he took up work at the Department of Explosives Supplies.

Nitrate of Soda Control Suspended.—The Minister of Munitions announces that the control of nitrate of soda will be suspended on and from May 15. General licences will, however, be issued until that date, authorizing dealings in nitrate of soda; but the licences will not authorize the holders to enter into any transaction which involves the actual movement of nitrate (except within the British Isles) before May 15. All applications for licences should be addressed to the Ministry of Munitions (Department of Explosives Supply), Storey's Gate, S.W.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

The Annual General Meeting of the Scottish Junior Gas Association (Eastern District) was held in the Heriot-Watt College, Edinburgh, last Saturday. Sympathetic reference was made to the recent death of Mr. J. B. Scott, of Cowdenbeath.

PRESIDENTIAL ADDRESS.

Mr. R. B. Waddell (Polmont) then delivered his address, which, after some remarks upon the Association's work under war conditions, proceeded as follows.

It is surprising to know that only a very small section of the people are aware of the great assistance that the gas industry gave to the various Government Departments in the prosecuting of the great World War, and also to find that even those who ought to be aware of this are not prepared to give the industry the moral support which it so richly deserves, and the very fact that the Government themselves are to all appearances "boosting" the electric industry to the utmost. Again, the various commissions that have been set up to investigate the housing problem are boldly setting forth that, as the result of their deliberations, they find electricity superior as a lighting agent, &c. Surely there must be something radically wrong that this should be so. Or is it simply the fact of the money interest? However, I do not think the gas industry will remain long under a cloud if everyone interested will do his little quota towards the advancement of the industry, whether it be in the way of manufacturing the gas, working-up the valuable bye-products, or improving the various gas appliances now in use.

STATUS AND REMUNERATION.

In the Technical Press much has appeared of late in regard to the status and remuneration of gas managers; and an attempt is being made to rectify this matter. I was very pleased indeed to read some time ago a notice by the North British Association of Gas Managers advising intending applicants for a managership then vacant not to accept less than a certain salary for the position. This was a step in the right direction, as no doubt some people will accept any salary whatever to get the position, forgetting that they are in the first place lowering themselves and doing infinite harm to others, although they may be at the time bettering themselves financially. There is no doubt that it is very difficult sometimes for a junior to get his first managership; and in some cases there may be a tendency to cut the salary. But I really think that this under-estimation of one's capabilities is fatal, and at the same time does incalculable harm to others. I would therefore at this stage take the liberty of suggesting that the members of this Association should form themselves into (say) "A Gas-Works Assistants' Protection Association;" and I have not the least doubt that our parent body, the North British Association, will give us every possible support if we simply become affiliated with them in some way or another.

STEAMING IN HORIZONTAL RETORTS.

This phase of the industry has been the subject of much contention, as to whether it is a financial success or not to steam the charges in a horizontal retort. It has without doubt been proved to the satisfaction of all that the steaming in verticals is one of the greatest advances we have made. This practice has come to stay, and will no doubt result in the lowering of the cost of production to a still further extent. So that it will be quite probable that many gas undertakings will be able to sell gas at 1s. 6d. to 2s. 6d. per 1000 c.ft., if the coal and material were somewhat reduced in price, and provided there are not heavy capital charges to meet.

In July of last year, I first tried the steaming of charges in horizontal retorts; and the result obtained was very encouraging indeed. No doubt when this process of increasing the make of gas per ton was first mooted—and even to-day there are some still sceptical—it was not considered practical; but I think those who have persevered with it and studied the defects, and have endeavoured to remedy them, have at least managed to keep up their supply of gas, even when the deliveries of coal were very meagre indeed.

In the first trial I had a superheater in one of the gas-flues underneath the bottom retorts. I found this, however, was very expensive to keep up, as at times there was not enough steam passing through, so that it got burnt out. The method of fitting-up retorts was to insert a perforated pipe through a hole bored in the retort-lid. A tapered plug was screwed on to the end of the pipe, so as to form a joint between the lid and the pipe. The connection to the steam supply was made with a union coupling. The whole apparatus can be easily connected by the stokers on the shift. The retorts were charged full from back to front, and, after eight hours had elapsed, the perforated steam-pipe was inserted. At first there was a tendency to have an excess of steam, resulting in the usual reduction of the temperature of the retort and weakening of the ammoniacal liquor. Another defect noticed was that the body of coke had not fallen down in any way for 3 ft. in the front of the retort, which made the drawing of the retort somewhat difficult. The latter defect was no doubt due to the fact that the temperature of the incandescent coke at the front of the retort was too low, and therefore the chemical action desired was not obtained.

After the above experience, I had pipes bored with $\frac{7}{16}$-in. holes at intervals of 4 in., and staggered as well, only to within 3 ft. from the mouthpiece. Secondly, instead of charging the retorts full from back to front, the charge was tapered off 4 ft. from the front of the retort gradually. Discs were inserted on the outlet sides of the steam-valves with a hole bored in them, and a steam-reducing valve fixed on the supply pipe to the retort, set at 40 lbs. These alterations resulted in much better working. The steam supply to each retort was constant, and could not be tampered with in any way. The reducing of the steam pressure from 60 lbs. to 40 lbs., and increasing the size of the holes in the pipe, resulted in the steam having a slower rate of travel, and, being more evenly distributed over the retort, increasing the contact with hot coke in the retort. The perforated pipes last for four to five weeks with proper care and attention.

Steaming the Charges in Retorts.

Monthly Report for October, 1918.

203 tons of coal at 25s. 6d. per ton (delivered at works), £261 3s.

			Per 1000 C.Ft.
203 tons at 25s. 6d.	£261 3 0	..	25·69d.
Stokers' wages	50 17 11	..	5·00d.
	£312 0 11		30·69d.
Tar and liquor saleable	£23 10 3	..	2·23d.
Coke saleable	140 3 2	..	13·74d.
	£163 13 5		15·97d.
Net cost of gas to holder			14·72d.

Gas made per ton of coal carbonized, 12,020 c.ft. (steaming).
Tar and liquor sold per ton of coal carbonized, 49 01 gallons.
Coke " " " " 9·00 cwt.

Ordinary Coal Gas.

Monthly Return for January, 1919.

259 tons of coal at 25s. 6d. per ton (delivered at works), £321 4s. 6d.

			Per 1000 C.Ft.
259 tons at 25s. 6d.	£321 4 6	..	28·26d.
Stokers' wages	49 7 9	..	4·34d.
	£370 12 3		32·60d.
Tar and liquor saleable	£32 17 11	..	1·89d.
Coke saleable	189 16 7	..	14·07d.
			15·96d.
Net cost of gas to holder			16·64d.

Gas made per ton of coal carbonized, 10,530 c.ft.
Tar and liquor sold per ton " 43 6 gallons.
Coke sold per ton " 10·00 cwt.

At present a bench of four retorts is being renewed with sectional silica retorts (95 p.ct.); and it is proposed to insert the steam at the back, which I think has several advantages over the system just described. In the first place, the upkeep of the pipe is done away with. The steam, being inserted at the back of the retort, comes in contact with the coke which is in the hottest zone of the retort, and therefore the desired chemical action is more rapid and complete. Again, the steam can be turned on (say) six hours after the retorts have been charged, resulting in the water gas produced passing through the partly carbonized portion of the charge in the front half of the retort, and thereby picking up the hydrocarbons, or, in other words, scavenging this portion of the charge.

No doubt, as we gain experience, many improvements will be made. It is surely more desirable, if possible, to produce water gas inside vertical or horizontal retorts, when we have already the necessary means of keeping the coke in an incandescent state, than to withdraw the coke from the retort by some mechanical means to an outside producer, cooling the coke in the process, and requiring to raise the temperature before being able to produce the gas.

It was my intention to have given a complete analysis of the resultant gases; but, unfortunately, I have not been able to get the delivery of the apparatus necessary in time to enable me to carry out the tests.

DISCUSSION.

Mr. Lawrence Farquhar (Alloa) said that steaming either in vertical or horizontal retorts was almost a new thing. Before the war, he had tried steaming in vertical retorts; but they had not reached the stage when a definite conclusion could be come to regarding the results. Steaming was a feature of modern carbonization, and was the result of the tendency to increase the yield of gas from any charge. There seemed to be a doubt as to whether the benefits derived from it outweighed the disadvantages. In some works, the results seemed to be beneficial; in others, they were not. Mr. Waddell mentioned that the gas industry had not received the recognition of the authorities in respect of what it had done in war-time. This was quite true. There seemed to be an electrical body behind the Government which was to a great extent "boosting" the idea of super-generating stations. He believed, however, that, when the whole subject came to be thrashed out, carbonization in gas and coke-oven plant would come to its own. They must use this to get the bye-products.

Mr. Gourlay (Markinch) said he had been trying steaming a little; but sometimes he thought they were better without steaming, when the loss in coal, coke, and tar was considered. He made a test one

day—allowing the coal to lie in the retort for five hours. The first hour gave 1000 c.ft.; the second hour about 700 c.ft.; and the next hour only about 200 c.ft. Putting the steam in at the back of the retort, he thought would be of advantage over introducing it at the front. Had Mr. Waddell observed any deterioration in the heating power of the gas with steaming? At the time they were steaming at Markinch they had several complaints from bakers that they were not getting the same heat from the coke used in their ovens.

Mr. Waddell, in reply, said that unless one used superheated steam, the temperature went down very considerably. They had been inclined to put in too much steam to start with; but it was surprising the small quantity of steam that was required. Since writing his paper, he had put in the steam at the back of the retort—only supplying steam at 10 lbs. pressure; and it had done very well. The ammoniacal liquor did not fall below 3½° Twaddel. The coke was certainly deteriorated. He had had the same complaints as Mr. Gourlay. In regard to a question asked by Mr. Campbell, of Kinross—as to whether he had found any deterioration caused in the retorts from time to time—Mr. Waddell said that his experience had not been long enough to enable him to say. But he had had considerable experience of steaming in vertical retorts; and he never saw any signs of deterioration in these retorts.

On the motion of Mr. Moyes (Granton), a cordial vote of thanks was accorded to Mr. Waddell for his paper.

New Office Bearers.

The office-bearers for the ensuing year were afterwards elected; and the report of the Council and balance-sheet were approved of.

Mr. Lawrence Farquhar, of Alloa, who has now been demobilized, succeeds to the presidency.

The Chairman took the opportunity of congratulating him, on behalf of the members, on his return to civil life. Mr. Farquhar, he said, had taken very great interest in the Association; and he hoped the members would turn out well during the session, and show their appreciation of their new President. Mr. Farquhar had done his bit in France; and it was up to the members to do theirs, and support him during his term of office.

Mr. Farquhar, replying, said it was almost impossible for him to express the pleasure he felt at being back at an Association meeting once again, and his thanks to the members for keeping the chair open for him during the past four years. It was one of the few, but greatly appreciated, compensations that had come to him after the rigours and strain of life at the front.

Mr. D. Campbell (Kinross) was elected Vice-President; and as Mr. M. Darling, of Aberdour, wished to retire from the office of Secretary and Treasurer, it was agreed—on the motion of Mr. Farquhar, seconded by Mr. Moyes—to appoint Mr. Laing, of Stirling.

The Chairman expressed the thanks of the Association to Mr. Darling for his services during the past two years.

Mr. Wm. Geddes, of Granton; Mr. A. M'Donald, of Prestonpans; and Mr. J. J. Scott, of Largo, were elected to the vacancies on the Council.

The arrangements for next year's syllabus were remitted to the Council; and, on the motion of Mr. Moyes, seconded by Mr. Gourlay, it was agreed to continue the subscription at 6s. and 1s. of a levy for another year.

Midland Junior Gas Association.—The annual general meeting of the Midland Junior Gas Association will be held in the Reading-Room of the Council House, Birmingham, on Thursday, May 1, when the report and accounts will be submitted. A smoking concert is being arranged in conjunction with the meeting.

Annual Meeting of the Society of Chemical Industry.—His Majesty the King has graciously consented to be Patron, and His Royal Highness the Prince of Wales Vice-Patron, of the annual meeting of the Society, which is to be held in London, on July 15 to 18. A General Committee is being formed, to include some of the foremost representatives of science and industry. The opening meeting will be at the Mansion House, when Prof. H. Louis will deliver his Presidential Address. The Chemical Engineering Group will take part in the conference.

Gas-Works Coal Stocks.—The "Iron and Coal Trades Review," in its last issue, says: The recovery in the position of gas-coal reserves shows how very favourable the situation would have become had no interruptions occurred in production. To some extent the position has been eased by the lengthened period of daylight and the operation of daylight saving. But, even allowing for these factors, the improvement is very marked; and the position is the most favourable shown since the first publication of the weekly list by the Coal Controller's Department. There are 22 gas-works with less than one week's supply (including five works with less than three days'); and 61 works with less than two weeks' supply.

An Allied Chemical Association.—The correspondent of "The Times" states that a two-days inter-allied conference in Paris of Associations of Pure and Applied Chemistry concluded last Tuesday with a banquet, among the 350 guests present at which were included Lord Moulton and Prof. Henry Louis. He adds that the conference has laid the foundation for an Inter-Allied Chemical Association, to replace the International Association of pre-war times. The initiative of M. Paul Kessner, of Lille, the President of the French Society of Industrial Chemistry, has attained its just reward, and it is hoped the position of the new Association, whose duty it will be to utterly defeat German competition in the chemical industries, will attract the adhesion of every one of the neutral countries.

COLLOIDAL FUELS.

Composites of Oil, Tar, and Carbon.

The Executive Committee of the Submarine Defence Association, of New York, have authorized the publication of a statement concerning new colloidal fuels developed under their auspices since the United States entered the war, and now fully tested and demonstrated. The author of the report is Mr. Lindon W. Bates (the Chairman of the Engineering Committee of the Association), in whose hands rests the commercial introduction of colloidal fuel, and who has had personal direction of its development. In making an oil-and-coal composite, an insuperable difficulty heretofore has been the persistent settling-out or sedimentation of the heavy coal and tar particles. This destroyed the value and utility of all mechanical mixtures.

To-day, the report states, it is possible to suspend for months in oil 30 to 40 p.ct. of coal, pulverized so that about 95 p.ct. passes through a 200-mesh screen, assisting the suspension with a special fixateur. It is possible to combine in a stable liquid fuel about 45 p.ct. of oil, 20 p.ct. of tar, and 35 p.ct. of pulverized coal, thereby replacing over one-half of the oil, securing equal or greater heat values per barrel, and saving considerable cost. Pulverized coal burned alone cannot in many cases replace oil. Especially is this true on shipboard. Radical changes in oil-burning installations become necessary; and its storage requires too much space, and in this way limits the cruising radius of war vessels.

Pulverized coal can be successfully held in suspension, so that the colloidal liquid flows freely through the pipes, preheaters, and burners of ships and power, heating, and industrial plants equipped to burn fuel oil. Months after mixing, the composites show little or no deposit. A fixateur, which comprises about 1 p.ct. or 20 lbs. per ton, acts to stabilize the particles of pulverized coal dispersed in the oil. In colloidal fuel, every solid particle has its film of liquid hydrocarbon and a protective and peptizing colloid, itself combustible. The particles are in three classes as to dimensions—coarse, colloid, and molecular. By coarse, is meant the fineness of fifty million particles per cubic inch. The fixateur and fixated oil are readily made, and may be shipped anywhere. The manufacture or distribution of the new fuels incorporating solid carbons in fixated oils involves no doubtful process or industrial problem. On burning, the combustion is so complete that, with fair coal, there is left no slag and very little ash; what there is being light as pumice and granular as sand.

It is the property of colloidal fuel that, without loss of efficiency per unit volume or change of oil storage or burning equipment, it makes possible the conservation of at least 25 p.ct. of the fuel oil now burned, or, conversely, with the oils now available it increases by 50 p.ct. the world supply of fuel that is liquid. A number of new fuels have been realized, each with varying percentages of oil and solid carbon. One useful composite, in the range of ordinary temperatures, is composed of about one-half coal and one-half oil. Another unctuous semi-liquid is nearly three-fourths coal and one-fourth oil. All the fuel pastes are mobile to sustained and easily applied pressure, and may thus be pumped, fed, and atomized in the combustion chamber. These semi-fluid composites will constitute the most compact and safest fuel for domestic and industrial use; and they will largely eliminate the smoke and ash nuisances of cities.

As an example of conservation to be effected through the new colloidal fuel, the report gives an estimate of what would result by its substitution for the 2,900,000 barrels of oil now consumed yearly in the power plants of New England. By displacing only 25 p.ct. of the oil with pulverized coal, a saving of 675,000 barrels would be secured. Estimates of the cost of this new fuel indicate a valuable reduction in the fuel expenses of New England power plants. Moreover, in New England, graphitic anthracites, gas-house coke and tar, and charcoal can be used effectively. Thus there may be a marked saving of transport—30 p.ct. as to oil, and 30 p.ct. as to coal. On the other hand, the 2,900,000 barrels brought to New England, when employed in colloidal fuel, can do the work of nearly 4,000,000 barrels, with the marked economies and advantages inherent to producing and applying heat with liquid as against solid fuel. Each locality may have its special composite, containing the cheapest available coal, oil, and other ingredients.

A demonstration test unit, to manufacture and use colloidal fuel on land, is installed at Brooklyn; and it is now to be tested at several steel-making plants. The largest field of use and oil conservation is in furnace work—direct fired, reverbatory, regenerative, and crucible furnaces; for brick-kilns, for air, annealing, bolt-heading, blacksmithing, brass melting, billet heating, forging, rivet heating, and open-hearth furnaces now fitted for oil. About 70 p.ct. of the oil they now use will do the present duty of 100 p.ct., and do it more cheaply. A certain steel plant uses 3000 barrels of oil daily, and will soon require 4500 barrels. But the 3000 barrels of oil with coal incorporated and used in colloidal fuel will be ample for full output, saving about 500,000 barrels per annum, with less cost, and with great conservation of actual oil and oil transport. There are legions of liquid fuel users large

and small. As a corollary of these developments, there will be very many more.

A further research was started by Mr. Bates in response to a suggestion from the Admiralty to try blending petroleum oils and coal tars, and see if it was practicable to stabilize the mixture so that free coke and asphaltic substances would not settle-out, but would produce a stable liquid fuel that could be shipped, piped, and stored. The quest was well worth while, because could it succeed one might so create annually in America and in England up to 20,000,000 barrels of superior liquid fuel, without an increase in oil-well production. Success is now confirmed. Thus countries without oil may themselves produce over one-half of the substances to make liquid fuel; and as the gas-house and coke-oven tars are usually cheaper than fuel oil, they will average-down the cost of oil in the composite.

To produce colloidal fuels, there are required:

(1) Certain processes modified, if need be, to suit the blend or grade desired.

(2) Certain fixateurs. Their offices are primarily to stabilize synthetic fuels whose separate elements are of different specific gravities and characters, so that the finished products have each a homogeneous and definite nature. Regarding the nature of the fixateurs and special incorporation and treatment process, it will suffice to say that the fixateurs and treatments produce a state in which the settling force of gravity, operating upon the particles somewhat according to Stokes' Law, is overcome by peptization, absorption, Brownian movement, electrical factors, and other chemical and physical phenomena—including such as obtain in colloids of metals, only that in the new case many of the particles are above colloidal size.

(3) Certain substances incorporated during the main process or when forming the "fixateur" which is itself incorporated. Their offices and properties are to effect chemically, or physically, or electrically, the characteristics of the components of colloidal fuels, either alone or in association with liquid or other combustible or non-combustible substances. They have properties in particular reference to: Suspending and dispersing solid particles of coarse, colloid, and molecular dimensions (coarse being used in a relative sense), or fluid sludge or asphaltic ooze, in a liquid or mobile gel or paste; dissolving and peptizing; establishing the desired viscosity, melting or fusing point, the chilling range or the desired flash-point; fluxing; enriching with combustible elements; dehydrating or hydrating; affecting the ash content and the sulphur content on combustion, catalyzing, or promoting the miscibility of two or more liquids; drying and inoculation. Some of these substances may remain in the colloidal fuel product in whole or in part, or, having performed their set duty, may be mostly distilled off and recovered and used again and again.

One of the advantages stated by Mr. Lucius H. Beers (the Chairman of the Submarine Defence Association) in a letter accompanying Mr. Bates's report, is that in making colloidal fuel great deposits of low-grade coal, which have been largely unavailable, as well as vast quantities of lignites, brown coals, and wasted dust, are added to the world's fuel supplies.

Tar Separating Arrangements at Providence.

In connection with the new water-gas plant installed at the gas-works at Providence (R.I.), as described by Mr. W. Russell in a paper read before the New England Gas Association, the tar-separating plant as first laid out gave trouble from failure of the tar to separate; and the system finally adopted was as follows: The liquor from the wash-box of the water-gas machines flows into a separator provided with baffles, causing the liquor to flow over and under them, and giving very sharp separation of tar. The tar and condensate from the overhead main, exhausters, drips, tar-extractor, and washer flow into another separator of the same dimensions and construction, except that, as they enter the first compartment, they pass through a demulsifying chamber containing coils of pipe to be heated by exhaust steam. The hot water coming from the separator which handles the wash-box liquor also flows into the first compartment of the separator. This hot water mixes with the tar and water and emulsion, and the heat assists in breaking-up emulsion and causing a good separation. A large part of the trouble from emulsification was due to mixing the effluent from the wash-box with the condensate, &c., from the rest of the water-gas plant. As soon as they were handled separately the trouble stopped. After passing the second separator, the liquor goes into a large tank, where any films of oily tar are skimmed off, and the water passes thence through coke-filters, coming out absolutely free from tar, oil, or suspended matter other than a slight brownish coloration, considered to be finely-divided carbon. Thus, in addition to keeping the wash-box effluent separate from the rest of the liquor until the tar has dropped out, the length of flow of the wash-box water has been doubled, as it passes through the first and also the second separator.

Mr. T. H. Poulson (Stafford) presided at a well-attended meeting of the Midland Junior Gas Association last Tuesday, when Dr. E. W. Smith, the Chief Chemist to the Birmingham Corporation Gas Department, delivered an interesting address on the subject of "Gas Quality." This was followed by a spirited discussion. A full report of Dr. Smith's remarks will appear in a later issue of the "Journal."

THE LIGHTING OF COTTON MILLS.

At a recent meeting of the New England Section of the American Illuminating Engineering Society a paper on the above-named subject was read by Mr. A. L. Powell.

The author pointed out that, with the development of higher-efficiency illuminants, and the wide variety of reflecting material, considerable changes have been brought into play in textile mill illumination methods. The improved mill constructions, with higher ceilings and light coloured surroundings, have been another factor in this change; while the gradual adoption of individual or group drive has, to a great extent, eliminated overhead obstructions in the way of shafting, belting, &c. General illumination by means of medium-sized and large lamps with suitable reflecting devices is now rapidly superseding the old methods of localized or localized general illumination. These changes have been attended by gains in economic operation, improved appearance of a plant, and more cheerful working conditions.

Among the points discussed by the speaker in his introductory remarks were: Artificial lighting as an element of production; light and safety effect of good illumination on surroundings and morale; choice of the proper lamp and reflecting equipment; maintenance of installation; colour of surroundings; systems of lighting; and methods of illumination and colour inspection with artificial light. Detailed data (accompanied by lantern slides made from night photographs) were presented, showing the present practice in lighting modern cotton mills. The best methods of lighting the individual processes of machinery—such as bale-breakers, pickers, card drawing-frames, slubbers, spinning-frames, warpers, slashers, looms, &c.—were described in detail, and the lighting requirements were analyzed in each case.

Uses of Gas Coke.

Some reflections on the fuel value of coke, by Mr. J. H. Coste, F.I.C., who is on the chemical staff of the London County Council, are contained in the April issue of the "Sentinel News." After explaining exactly what coke is, he says that in all respects cokes from different coals and from different gas-works will be much more alike than the coals from which they have been prepared. Differences found are due principally to varying ash content; and it is pointed out that nothing which is done in gas-works will remove the ash from coal. Though a furnace constructed to burn gas coke will burn all gas cokes almost equally well, Mr. Coste expresses the opinion that the preference is usually to be given, for steam-raising purposes, to coke "from not too up-to-date gas-works." The reason he gives for holding this view is that "large works, with retort-settings calculated to give very large yields of gas by carbonizing at very high temperatures yield a hard coke too much like the product of coke-ovens, which is made only for metallurgical purposes, and which is rather difficult to keep burning without a forced draught." His summing-up of the matter generally is, however, that the user of gas-works coke has a fair idea of the kind of fuel he is going to burn; whereas at the present time the man who wants coal must take what he can get, and risk its suitability for his purpose.

Industrial Councils and Reconstruction Committees.

There has been issued by the Ministry of Labour an edition, complete up to the present month, of the Directory of Joint Standing Industrial Councils, Interim Industrial Reconstruction Committees, and Trade Boards, with an index of members. These three types of representative industrial organization are the recognized bodies to advise and assist the Government on questions concerning their industries. The first-named carry into effect the proposals of the Whitley report. Reconstruction Committees have been formed in certain industries where, from various reasons, progress towards the formation of Industrial Councils has been slow; while the Trade Boards are composed of representatives of the employers and the workpeople in the trade, together with several persons appointed by the Minister of Labour. There is a Chemical Trade Joint Industrial Council; while there are Interim Reconstruction Committees for the gas-mantle industry and the fertilizer industry. On the Gas-Mantle Committee, the employers are represented by the Association of Incandescent Mantle Manufacturers; and the Chairman of the Committee is Mr. C. S. Garland. On the Fertilizer Committee, the Sulphate of Ammonia Association are represented by Mr. F. C. O. Speyer. The intention is to issue supplementary and revised editions of the directory from time to time. Reference was made in the news columns of last week's "Journal" to a Joint Industrial Council for municipal and company-owned gas undertakings.

At a meeting of the Institute of Chemistry (Birmingham Branch) at the Chamber of Commerce, Birmingham, last week, the functions of the Industrial Research Laboratory of the Gas Department of the Birmingham Corporation were considered. It was generally agreed that a municipally-owned research laboratory would fill a necessary want, if restricted in its activities to matters which could not satisfactorily be dealt with by the well-established consultant chemist, and upon lines approved by the Institute of Chemistry.

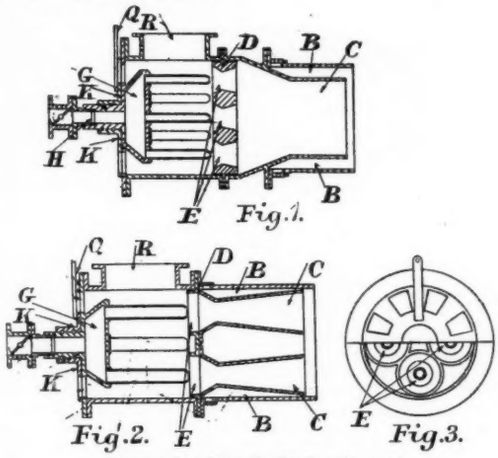
REGISTER OF PATENTS.

Atmospheric Burners.—No. 123,434.

Weyman, J. E., of Newcastle-upon-Tyne.

No. 4416; March 13, 1918.

The patentee points out that for obtaining the highest efficiency when burning gas of low calorific value and at low pressure three conditions are essential: (1) The automatic regulation of the proportion of air to gas; (2) intimately mixing the air and gas in the burner; (3) obtaining a suitable speed of the mixture that issues from the nozzle of the burner. The second and third he says is obtained in the following manner: He employs a burner, the body of which may be of circular or other form, having a decrease in diameter at the nozzle end, surrounding which are the usual secondary-air space and ports. The body of the burner is divided into two parts by a casting, in which are a number of circular openings larger at the inlet than at the outlet ends—the smaller ends being towards the nozzle of the burner. Corresponding, and fixed centrally to these openings in the division plate or casting and on the gas supply side of the division, are tubes through which air under pressure is supplied. The gas is supplied to the burner through a connection to the outer side of the division casting. The air supplied under pressure to the tubes is automatically controlled by the pressures in the gas-main, by a governor, which may also revolve more or less the discs at the back of the burner and so regulate the additional primary air supply.



Weyman's Atmospheric Gas-Burner.

The illustration, fig. 1, is a longitudinal section of his burner; fig. 2 shows a burner in which either the primary or the whole of the air for combustion may be mixed with the gases in the burner; while fig. 3 represents an end view and part section.

The body of the burner has the gas connection at R; while B is the secondary air supply space surrounding the burner nozzle C. D is a plate dividing the body of the burner into two parts in which are circular orifices E, larger at their inlet than outlet ends, with air-tubes fixed concentric with them, through which air is forced under pressure. G is an air-chamber to which all the air-tubes are fitted, and having connection through the centre of the cover to the air supply pipe H. The cover is made with ports, and a disc K has similar ports revolving on the centre boss, which is part of the cover. In the air supply pipe H, an equilibrium valve is placed, connected up to a governor, the movement of which corresponds to the pressure in the gas-main. The disc K is also connected to the governor by mechanism coupled-up to the lever Q, so that, as the gas-pressure rises or falls, the air-valve is more or less opened, and also the ports in the cover by the movement of the disc, through the action of the governor; and air is thus supplied in proportion to the gas pressure and volume. Upon the gas supply failing, the governor closes the valve and moves the disc K, so as to cover the ports and cut off the air supply.

As the air is supplied under pressure, an induced draught is created at the orifices E, which draws in the gases in proportion to the speed and volume of the air supplied through the pipe H, and by this means both a thorough mixing of the air with the gas is effected, and a high velocity of the mixture issuing from the nozzle of the burner is obtained.

In fig. 2, the orifices E are fitted with extended nozzles; and the mixture of air and gas is delivered from each of the nozzles separately at the end of the burner, in place of the mixture of gas and primary air being delivered into the contracted end of the burner forming one common nozzle.

Gas or Electric Cookers and Solid Fuel Stoves Adapted to be Used in Combination.—No. 123,878.

Jenkins, E. J., of Rotherham, and Smith, A. S., of Chiswick.

No. 6562; April 18, 1918.

This invention relates to an arrangement whereby a gas or electrically heated cooker and a solid fuel stove (each a separate self-contained unit) may be adapted so as to be connected when desired with each other "in order that the gaseous products from the stove may circulate in flues added to, and surrounding or partly surrounding, the cooker." As an addition to such a cooker, flues may be arranged on any or all sides (except the front) and the top and bottom; the upper wall of the top flue, which serves as a hot plate, having depressions or partitioned-off portions to receive removable gas rings or burners.

Gas-Fired Boilers.—No. 124,016.

Kirke, P. St. G., of Victoria Street, Westminster.

No. 2520; Feb. 12, 1918.

This invention relates to gas-fired boilers of the type in which a number of burners is nested in one or more gas supply boxes, placed in front of the boiler tube plate, so that each burner is fed from the box and is opposite to, or co-axial with, its corresponding boiler tube.

One object of the invention is to obtain a multiple burner arrangement which, when once adjusted, can be controlled by one or two large valves. Another object is to enable a burner arrangement to be made for supplying a multitubular boiler having long separately fired tubes of comparatively small bore and considerable length; so that the cost of the boiler shell per square foot of heating surface may be reduced. A third object is the provision of a nest of burners which can be adjusted individually and also collectively.

The patentee says that he has found by experiment that when the initial pressure lies between one inch and four inches of water, the quantities of gas flowing through restricted orifices vary approximately according to the same law, although the orifices may be somewhat different in size and shape and pass different quantities of gas. Again in practice, he has found it difficult to obtain boiler tubes of exactly the same bore, owing to the fact that the stay tubes are usually thicker than the ordinary tubes; and it is also difficult to get exactly the same degree of suction down each boiler tube. For these reasons in practice a multitubular boiler having a burner for each tube will consume varying amounts of gas in the different tubes when running efficiently; and it is consequently necessary to provide some adjustment for regulating the quantity of gas burnt in each tube. This adjustment of gas to the separate tubes having once been made when the boiler is started up, subsequent regulation of load can be obtained by controlling the pressure of the gas at each burner and the suction on the boiler. By his invention, control of pressure to a number of burners is obtained by operating only one valve, because, although the tube centres are fixed, their dimensions may be increased sufficiently to ensure the pressure at all the burners being the same even when large volumes of gas have to be supplied to a great number of burners placed close together—there being no wire-drawing to cause the pressure of one valve to be different from that of another. Moreover, by making the valve-spindles hollow, it is possible to see how the combustion is proceeding in each tube.

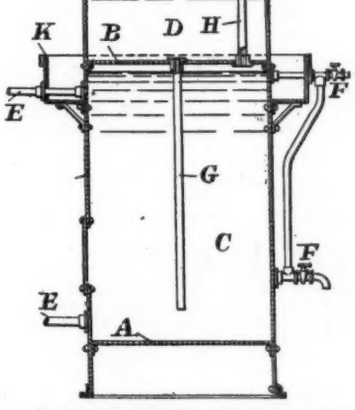
Lighting-up is facilitated by having pilot gas-jets on the top of each burner; so that when the valve is turned on the gas is automatically lighted.

Hot Water Supply.—No. 124,340.

Potterton, T., of Balham, S.W.

No. 10,065; June 18, 1918.

This invention relates more especially to apparatus for supplying the jackets of the cylinders of internal combustion engines and aero engines with hot water. The cylinder is divided by a horizontal water-tight partition into two compartments (the lower filled with water) connected by pipes leading, respectively, from the top and bottom of the compartment to the boiler, the circulation in which is maintained in the usual manner. A supply of cold water is stored in the upper compartment of the cylinder, and communicates with the hot-water compartment by a feed-pipe passing through the water-tight division, and replaces the hot water drawn off for the engines.



Potterton's Hot Water Supply Apparatus.

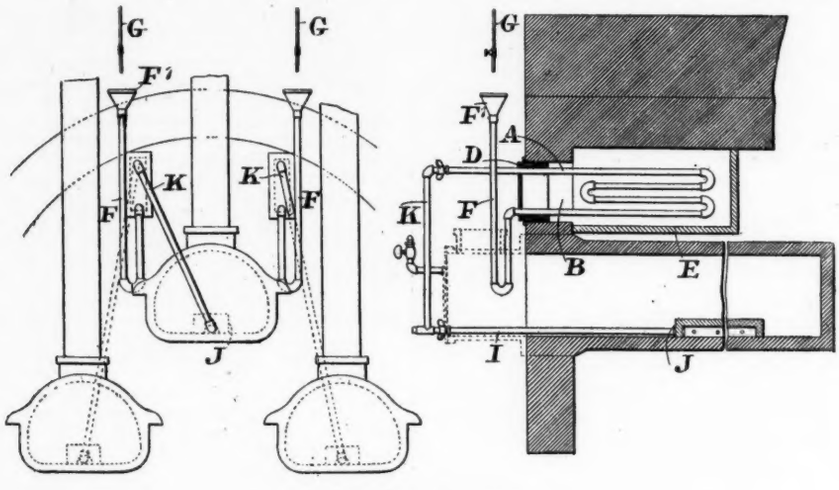
The cylinder shown is divided by a horizontal water-tight partition B into a lower compartment C containing a supply of hot water, and an upper compartment D containing cold water. The compartment C is connected by pipes E with a boiler, and the hot water can be drawn from the compartment as required, through cocks F. A feed-pipe G, open at each end, leads from the compartment D to the compartment C; while a pipe H, communicating at its lower end with the compartment C and at its upper end with the upper part of the compartment D, allows for the expansion of the heated water, or the escape of air or steam. An annular tray K round the upper part of the compartment C is for the purpose of warming lubricants under exposed conditions.

Manufacture of Gas.—No. 124,247.

Rew, R. J., of Exeter.

No. 3282; Feb. 25, 1918. No. 11,318; July 10, 1918.

This combined invention relates to the manufacture of gas in horizontal retorts; and has for its object to provide for the generation of water gas on the introduction of steam into the retorts after the distillation has been completed or almost completed, "whereby a considerable yield of water gas may be added to the make of coal gas, and thus secure economy in the use of the coal or other carbonaceous substances employed."



Rew's Retort Apparatus.

The illustration shows a partial elevation and a partial sectional elevation of a retort-setting within a single arch.

The steam-pipe A is passed into the furnace setting beneath the arch, through a hole B provided with a fitting within which is mounted a closing cap D, upon which the steam-pipe is mounted. A fire-clay casing or enclosure E (of complete rectangular or other sectional form) is arranged at the end wall of the setting in such manner that while the steam-pipe is protected from the action of the furnace gases and so acquiring too high a temperature, the interior of the enclosure will, in working, be maintained at the necessary high temperature to ensure the production of superheated steam or steam generated to the desired high temperature.

The steam-pipe provided may be of **U** or **W** shape, or provided of spiral, zig-zag, or other form, with a view to secure an adequate length of piping for the steam to traverse, and so ensure its being heated to the necessary degree. The inlet end of the pipe carried in the cap D is fitted to a pipe F of **U** shape, the outer limb of which rises higher than the inner one, and has a funnel mounted on it, into which water can pass from a service pipe G under the control of a tap. The outlet end of the steam-pipe is connected with a steam-pipe I (passing into the retort) the end of which is secured by nuts to the end wall of a perforated plate J extending over a considerable part of the length of the retort.

In operation, when the generation of water gas is to be started, water is caused to flow into the pipe F, and thence into the pipe A, where it is vaporized and superheated, and passes into the retort through the steam-pipe I, "where it is uniformly distributed throughout the charge therein for the generation of water gas."

The length of piping K may be connected to the steam-pipes A and I by unions which may be unscrewed when it is desired to open the retort lid to withdraw the charge, and to permit of the withdrawal of the pipe A during distillation. The connection of the pipe K with the pipe I may be effected beneath the retort, in order to avoid connection through the lid—as, for example, where the retort-lids are of the self-sealing or hinged type. A number of connecting pipes K may be employed for supplying steam from one steam-pipe A to a number of retorts, as illustrated in dotted lines.

The invention comprises the provision of the superheating pipes within the retort itself. The superheating pipes, resting upon the floor of the retorts, are arranged in coils or otherwise in order to give a tortuous course to the steam, whereby the steam may be raised to the necessary high temperature before it reaches the incandescent coke. For this purpose, the superheating pipes are arranged so as to be easily withdrawn when required through the mouthpiece of the retort.

Low-Temperature Distillation of Coal.—No. 124,231.

Nelson, J., of Glasgow.

No. 18,983; Dec. 21, 1917.

This invention consists in the low-temperature distillation of carbonaceous material by submitting it to the action of a current of vapours and gases obtained by cracking hydrocarbon oils or the gases left after separating the condensable hydrocarbons therefrom, which have previously been heated to a temperature of 350° to 450° C.

The patentee points out that the chamber containing the coal may be covered with insulating material to avoid undue loss of heat, or it may, if desired, be heated externally to a temperature not exceeding that of the incoming vaporized oil or gas. It is important to avoid local overheating (to above the temperature stated) of the material in contact with the walls of the chamber. The volatile and gaseous products issuing from the chamber are condensed, collected, and worked-up, he says, in known ways. If the carbonaceous material employed be a gas-making or household coal of good quality, the residue in the chamber is of value as a smokeless fuel, suitable for use in domestic open grates.

He prefers to conduct the process in conjunction with that of cracking hydrocarbon oils as described in his patent No. 116,304. When operating this combined process, the mixture of vapours and gases issuing from the cracking plant, or the gases left after separating the condensable hydrocarbons therefrom, are led—with or without the addition of superheated steam, and at the temperature specified—through the carbonaceous material, and the products are afterwards condensed, collected, and worked-up as mentioned. In this case, the volatile hydrocarbons obtained by the fractional distillation of the condensed products are suitable for use as motor fuel; while the heavier hydrocarbons may be subjected to a cracking process.

The rate at which the vapour or gases are led through the carbonaceous material varies largely, according to the nature of the material and the extent to which it is desired to push its treatment. When operating with a charge of 56 lbs. of gas-making coal, he has obtained satisfactory results by leading through it the vapours and gases produced by cracking, at the rate of 8 gallons per hour, a paraffin oil of specific gravity ·803; the cracking being effected by means of molten lead as described in his earlier patent.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for April 16.]

Nos. 8670—9402.

Boulton, P. R.—"Absorption apparatus for analyzing gases." No. 9136.

Cadett, J. W. T.—"Valves and cocks." No. 9318.

Castelli, S. T. S.—"Means to generate gas from coal, &c." No. 9361.

Corthesy, J. H.—See Castelli. No. 9361.

Evans, A. J.—"Utilization of trinitrotoluene for production of fuel gas and ammonia." No. 9220.

Firth Blakeley, Sons, & Co.—"Assorting materials of different specific gravities, and washing same." No. 8851.

Hadfield, Sir R. A.—"Apparatus for conveying and screening materials, &c." No. 8792.

Lambert, W. H.—"Incandescent burner for upright mantles." No. 8962.

Lea, D. H. & F. M.—"Gas cooking-stoves." No. 8866.

Lea, D. H. & F. M.—"Gas heating-stoves." No. 8867.

Lea, D. H. & F. M.—"Gas heating-apparatus." Nos. 8868, 8869.

M'Poland, T. J.—"Apparatus for controlling flow of liquids or gases through pipes, &c." No. 8942.

Naito, A.—"Analyzing or estimating volatile constituents of coal." No. 8708.

Redmond, E.—"Incandescent gas-burners combined with shock-absorbing means." No. 9229.

Shaw, E. J. A.—See Firth Blakeley. No. 8851.

Stone & Co., J.—"Liquid meters." No. 9122.

Struckman, E. F.—"Ignition devices for gas-stoves, &c." No. 8698.

Wells, A.—See Stone. No. 9122.

APPLICATION FOR LICENCES.

Messrs. Humphreys and Glasgow have made application, under the Trading with the Enemy Amendment Acts, for the grant of licences in connection with the following patents, vested in the Custodian, relating to the production of hydrogen: Clark (*Dellwik-Fleischer Wassergas Ges.*), No. 21,479 of 1908; Lane, No. 17,591 of 1909; and Messerschmitt, Nos. 12,242 and 12,243 of 1912, and Nos. 17,690, 17,691, 17,692, 18,028, and 18,942 of 1913.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The petition of the Dover Gas Company for leave to bring in a Bill was read, and referred to the Examiners.

The Sunderland Gas Bill and the Stourport Gas Bill were read a third time, passed, and sent to the Commons.

The Brentford Gas Bill has received the Royal Assent.

HOUSE OF COMMONS.

Progress of Bills.

The Sunderland Gas Bill and the Stourport Gas Bill were read the first time, and referred to the Examiners.

Ormskirk Gas and Electricity Act, 1915.

In exercise of the powers conferred upon them by the Special Acts (Extension of Time) Act, the Board of Trade have extended for a period of one year from June 24, 1919, the time limited by the Ormskirk Gas and Electricity Act, 1915, for the compulsory purchase of lands for the purpose of that Act.

Dover Gas Bill.

Notice has been given by the Dover Gas Company of their intention to apply for leave to bring in a late Bill to increase their borrowing powers; to substitute a calorific power test of the gas for the existing illuminating power standard; to make new and further provisions with regard to the payment of dividends on preference shares or stock; and to provide for annual instead of half-yearly meetings.

LEGAL INTELLIGENCE.

JUDGE PARRY ON AN EXCELLENT SCHEME FOR EMPLOYEES.

At the Lambeth County Court, before Judge Parry, on Friday, the 11th inst., Mrs. Mary Parr, Vauxhall Mansions, Glasshouse Street, Vauxhall, brought an action under the Workmen's Compensation Act against the South Metropolitan Gas Company for compensation for injuries received while in the course of her employment.

The respondents had filed a defence that the Judge had no power to proceed to arbitration, as the respondents had an accident fund for the benefit of their employees in substitution for the provisions of the Workmen's Compensation Act, and which fund was on Aug. 30, 1907, duly certified by the Registrar of Friendly Societies pursuant of section 3 of the Act, and which accident fund was duly renewed by the certificates of the Registrar on June 7, 1913, and again on June 28 last year, of which accident fund applicant was a member. From Jan. 4 last year applicant was paid (and accepted payment under the accident fund to June 30) 1s. 6d. a day, and from then 2s. a day, *plus* in each case a war bonus of 7s. 3d. a week to Sept. 12, 1918, when she was declared fit for work. She returned to work on Oct. 3, accepting light work at 3s. 2d. a day and war bonus till Oct. 19, when she was away ill, suffering from influenza and bronchial catarrh. On Nov. 21 she was offered work as a messenger, still under the accident fund, but did not accept, and had not been to work since.

Mr. C. Williams appeared for the applicant; and Mr. Duckworth for the respondents.

Mr. Duckworth said he should raise the preliminary objection that the Court had no jurisdiction. A similar case was before his Honour in March, 1917, when he came to the conclusion that the applicant had contracted-out, and he had no jurisdiction.

Mr. Williams said that might be so, but he submitted that every case must be determined on its merits.

Judge Parry: The point I shall have to decide first is whether the applicant comes under the respondents' scheme, and whether or not she has contracted-out.

Mr. Duckworth: I do not think you have any jurisdiction, as the applicant here (as in the previous case) has contracted-out, and received benefits from the accident fund.

Judge Parry: I must hear the applicant before I come to any decision.

Mr. Williams said Mrs. Parr, in the absence of her husband, who had joined the army, commenced work as a labourer with the respondents on Dec. 31, 1917. She was on the night shift, and had only been at work for two or three days when on the night of Jan. 3-4 she was loading a hopper. There was a gap in the floor; and, in stepping back, she fell through the hole to the room below—a distance of 12 feet. She was very seriously injured. She was then on piece work; and therefore it was difficult to ascertain what her weekly wages would be. In October she was able to go back and do some light work for a fortnight, when she was unable to do any more, and had to return home. She was paid about 18s. 11d. a week during the time she was away ill.

Applicant bore out this statement, and added that she was asked by the foreman to shut a retort-door, which she had never done before. She did this with a shovel, and not with a backing rake; and consequently she slipped back, falling through the gap in the floor. After her return in October she received an increased payment of 27s. a week. The light work offered her was scrubbing the canteen floor at night; but she could not do this for more than a fortnight.

In reply to Mr. Duckworth, applicant stated that she had no recollection of receiving a book of the rules of the accident fund on Dec. 31; but she admitted that the signature produced under this date was her signature. She remembered being given a copy of the rules in October.

Mr. Duckworth: They were revised in July, and then you were given a fresh copy. Ever since the accident, you have been paid certain benefits?

Applicant: Yes.

Where do you think they came from?—I could not say. I thought I was entitled to them.

Do you know that a penny was deducted every two months from your pay?—Yes.

Do you know what it was deducted for?—No.

Judge Parry: Did you not ask?

Applicant: No. I was getting the money; and I thought it would be rather mean to ask what it was for.

Mr. Duckworth: Was there an inquiry by a jury into your case in March?

Applicant: Yes.

Mr. Duckworth: And did they find that it was an accident, and that you were entitled to benefits; and did they make some recommendations as to what should be done in future?—Yes.

Mr. Duckworth: They found that notices should be put up to the effect that the proper tools should be used in certain work, and that a backing-rake and not a shovel should be used to close the retort-doors. They also recommended that new hands should commence on day work first?—Yes; they made the recommendations after I had met with my accident.

Judge Parry said he should not trouble Mr. Duckworth, as he had come to the conclusion that the applicant had contracted-out of the Act. It seemed to him that schemes like this one of the respondents were very excellent. He had no doubt they were thoroughly well managed, and for the benefit of the workmen. Any man could go before a jury of his own workmen, and have the matter thoroughly discussed, as appeared to have been done here. The scheme of the respondents had been in existence for a long time, and appeared to have worked satisfactorily. As soon as an accident happened the man or woman was immediately looked after, and had no occasion to go to any lawyers, or wait for Court proceedings. They got their benefits at once. This woman had been well looked after under the scheme. If a workman had any complaint, there was nothing that could be more advantageous to him than to lay the complaint before a jury of his fellow workmen, who could decide the matter—as was done under this scheme—much better than he (the Judge) or any lawyers could decide. He held that applicant was a member of the respondents' benefit scheme, and had contracted-out under the Act. He accordingly made an award in their favour.

Mr. Duckworth said he should not ask for costs, except it might be against the solicitors, who had gone on with the action after the respondents had filed their defence.

Judge Parry: There will be no costs.

The Limitation of Output.

Mr. Andrew Stewart, writing in the "Engineering Review," concludes an article on the "Limitation of Output" by remarking that "capitalists of one kind or another have existed through all stages of history. They will continue to exist, perhaps only on sufferance as vulgar taxpayers; but they cannot be eliminated so long as human beings differ in ability, ingenuity, and capacity for work. It is a curious, yet significant, fact that in the country boasting of the largest amount of capital, and where there are most capitalists, the working men earn most, and buy most. If you find a workman in the whole of Europe who wants to improve his chances in life, he will tell you he contemplates emigrating to America. Why not set to work to make Britain as attractive to live in as America? It can be done, if employers and employed set about it in the right way." The object of his article is to demonstrate that the "ca-canny" policy, if persisted in by the workers, will reduce wages and aggravate unemployment; and his arguments are accompanied by some striking diagrams. It is pointed out that the amount of coal produced per man in this country has steadily declined during the last ten years, while the wages per man have increased. During the period from 1905 to 1914, the average output of a British coalminer was less than one-half that of an American miner. Diagrams based on an investigation carried out by the United States Government, show that, taking the average requirements for a week's work, the American workmen can get nearly three times as much as the British workman; while others illustrate the extraordinary difference which exists between the production of three staple commodities per employee in this country and in America. This difference is indicated in another way by the fact that, while in England horse power used per employee in the machine tool industry is 0·6, the average in the American industry is 1·9.

A projected exhibition in Athens of British manufactures had its beginning in a suggestion made last October by the delegation of Greek business men who toured industrial England under the auspices of the Federation of British Industries. Having investigated, through a Special Commissioner, the extraordinary scarcity of every kind of manufactured article in Greece and the neighbouring Balkan and Levantine countries, the Federation agreed with Greek opinion that an exhibition would offer very extensive opportunities to British manufacturers; and such an exhibition is, therefore, now in active process of organization. The Machinery Section of the exhibition will be of great importance. Major Kennard, the Federation's Commissioner to Greece, who is shortly to be established permanently in Athens, has been touring all the principal industrial centres of England, giving manufacturers the benefit of his experience.

MISCELLANEOUS NEWS.

LARGE INCREASE IN PRICE IN EDINBURGH.

In September last, the Edinburgh and Leith Gas Commissioners increased the price of gas from 3s. 8d. to 4s. 4d. per 1000 c.ft., for the six months ending April-May, 1919; the usual custom of settling the price for a year having been departed from in view of unsettled conditions as to wages, coal, &c. At their meeting on the 14th inst., the Commissioners had before them the estimates for the year ending May 15, 1920. The expenditure on revenue account is expected to reach a total of £461,849, as compared with £366,939 in 1917-18, an increase of £94,910, or 26 p.ct. Mortgage interest and other fixed charges will require £120,950, making the total expenditure for the year £582,799. To this sum, however, has to be added the deficiency in the accounts for 1917-18 (£18,550), and the estimated deficiency for the current year (£13,450), making a grand total on the debit side of £614,799. An improvement is expected in the returns from residuals (especially from coke); but this is partly neutralized by the loss of revenue under the head of "toluol and benzol."

In the course of his statement, the Engineer (Mr. Alexander Masterton) remarks that coal and other materials used in the manufacture of gas have been taken at current prices (coal being 24s. 9d. per ton), and that the quantity had been based on the production of gas of a similar quality to that which has been manufactured since the cessation of benzol recovery. The great increase in expenditure is primarily due to advances in workmen's wages, which amount to 70 p.ct. over the wages paid in 1917-18 and 118 p.ct. above the 1913-14 figures.

The Treasurer (Mr. A. Canning Williams) deals with rates and taxes, superannuation fund contributions (which, he points out, will be increased if war bonuses are converted, wholly or in part, to permanent wages), and the debit items of the profit and loss account. Mr. Williams states that "the rise in the cost of borrowed money is making itself felt with increasing force as mortgages at the old rates of interest fall in and are renewed or replaced at 5 p.ct. Thus annuities, interest, and contributions to sinking funds, which in 1913-14 amounted to £92,913, increased to £97,712 in 1917-18; and the estimated figure for 1919-20 is £103,400."

The Commissioners decided to increase the price of gas 8d. per 1000 c.ft. (making it 5s.) for the six months from April-May to October-November, but to make no change in the charge to prepayment consumers, which at present is 7d. per 1000 c.ft. in excess of the ordinary consumers' price. The slot-meter consumers receive 16 c.ft. for 1d.—practically 5s. per 1000 c.ft.—and as it is anticipated that the increase in the price to the general consumer will not be permanent, it has been thought unnecessary to incur the expense of altering the mechanism of the meters.

SOUTHEND GAS COMPANY'S UNDERTAKING.

Corporation Considering Purchase.

A Special Committee appointed by the Southend Corporation report that, as instructed by the Council, they are considering the advisability of acquiring the undertaking of the Southend Gas Company, so as to present a full report to the Council at a later date.

In order that they may give proper consideration to the subject, the Committee are of opinion that they should have the advice of a responsible gas engineer; and they accordingly recommend that they be authorized to retain the services of a consulting gas engineer, with a view to his reporting to them as to the condition and value of the undertaking.

The Gas Committee have resolved that the following particulars of the expenditure proposed to be incurred at the Leigh Gas-Works during the next two years, and which will necessitate borrowing powers being obtained, be submitted to the General Purposes Committee:

1.—Retort-setting and ironwork, and amount spent in excess of sanction for retort-house	£2500
2.—New boiler	400
3.—Mains	3000
4.—Cookers	1000
5.—Services	500
6.—Meters	500

It was resolved that the Committee inform the Council that, in their opinion, a considerable expenditure will be required in the near future on machinery and appliances for the works, in order to meet the necessities of Leigh, and that they have not dealt with this matter in presenting the above particulars, inasmuch as the Special Committee appointed to consider the advisability of the Council acquiring the Southend Gas-Works have not yet presented their report.

AUCKLAND (N.Z.) GAS COMPANY, LTD.

The fifty-seventh annual meeting of the Company was held at Auckland on Feb. 3—Mr. J. H. Upton (the Chairman) presiding. In moving the adoption of the report and accounts, he pointed out that the income from the sale of gas in the twelve months ended Dec. 31 was £227,231, or £20,048 more than in the previous year. This was partly due to an increased price; but it was also owing to a rise of nearly 3 p.ct. in the quantity of gas sold. The total receipts were £271,767, and the expenditure £217,372, leaving £54,395 to be carried to the profit and loss account. He drew attention to the low charge made by the Company—6s. per 1000 c.ft.—as compared with other local undertakings, and said that the amount paid for rates and taxes was equal to 8·4d. per 1000 c.ft of gas sold. The report was adopted; and a dividend was declared for the past half year of 11d. per share on the £1 fully-paid shares, and a proportionate dividend on the £1 contributing shares (9s. paid), which would absorb £27,533. An interim dividend had already been paid amounting to the same sum.

COLLIER'S FIGHT AGAINST SUBMARINES.

In the middle of 1917, when the Gas Light and Coke Company's collier fleet was sustaining serious losses owing to enemy action, a boat was purchased which was afterwards named the "Horseferry;" and a photograph, together with some particulars of her career in the Company's service, appears in the current number of the "Co-Partner's Magazine." After having been running on the Tyne-London route a few weeks, she had a successful encounter with enemy submarines. Captain E. T. Skellern's report on the subject is now published, in which he says that at 9.45 in the morning of Aug. 17, when on the bridge with the Chief Mate, they saw a torpedo coming towards them, and located the submarine from which it had been discharged. He proceeds: I immediately ordered the helm to be put hard-a-starboard, and am pleased to state the torpedo passed clear of our port quarter by about 50 ft. Not more than a minute would elapse before the first shot from our gun was fired at the submarine. The shot was an excellent one, and gave us the exact range. In all we fired seven shots; and all hands agree that the fifth and seventh shots struck the submarine (the first when the conning tower was well out of the water, and the second was when the deck was well awash), as violent explosions were observed on each occasion. Immediately after our last shot, and when the smoke of the explosion had cleared away, we found that the submarine had disappeared; and, taking into account the very short time which elapsed between our striking him and his disappearance, I have no hesitation in saying that he had not voluntarily submerged, but that we had sunk him. We at once proceeded on our voyage to the Tyne, and at about 11.20 a.m., when two miles north off Flamborough Head, we sighted another enemy submarine's periscope on our starboard quarter at a distance of about three miles. Our gun was immediately trained on him; and we fired four shots, when he disappeared from view. We arrived in the Tyne without any further adventure. Only one torpedo was fired at us by the first submarine, who, I suggest, was rising with the object of training his deck gun on us. The whole of our crew behaved excellently, carrying out orders without the slightest confusion, boats being cleared away and magazine and gun completely manned in under two minutes.

The "Magazine" adds that the authorities were evidently satisfied that one submarine, at least, was placed *hors de combat;* for their investigations resulted in Captain Skellern receiving the D.S.C. at the hands of His Majesty the King. Gun-layer Bennett, R.N.V.R., received the D.S.M.; and a substantial sum of money was granted to the officers and crew by the Admiralty. The Directors of the Company also showed their appreciation by presenting a gold watch and a clock, suitably inscribed, to the Captain and Gun-layer respectively, and war bonds to officers and crew.

THREATENED STRIKE OF EDINBURGH GAS WORKERS.

On March 19, a conference took place between representatives of the Corporations of Edinburgh and Leith, the Gas Commissioners, the Water Trustees, and the National Union of Corporation Workers, on the questions of increased bonus and the number of working hours per week. An agreement was reached between the Gas Commissioners and the Union on the bonus matter, but not on the question of hours. The Commissioners having stated that the general workers' standard week must be one of 48 hours, and the Union representatives having intimated that they could not agree, the subject was deferred for further consideration.

At the adjourned conference on April 2, a 48-hour week was accepted by the Union, and it was arranged to have a meeting between a Sub-Committee of the Commissioners and the Employees' Committee on April 7, to adjust the time-table. At this meeting, the representatives of the general workers intimated that it was intended to hold a mass meeting to consider whether the claim for a 44-hour week should be waived and a 48-hour week accepted, as agreed upon at the conference on April 2. The Sub-Committee placed the following offers before the employees' representatives: General labourers to receive 51 hours' pay for a 48-hour week; men on the shift, 52 hours' pay for a 48-hour week; employees who work over 56 hours to get a reduction of eight hours with four hours' additional pay, and, if no reduction of hours is possible, to receive four hours' extra pay at present rates. Further, the Commissioners suggested that all the foregoing men should be paid ½d. per hour extra, but that sick allowances and holidays with full pay should be withdrawn.

A mass meeting of the men interested was held on the 13th inst., when the Commissioners' offers were rejected. It was also decided that, in the event of a satisfactory arrangement not being arrived at by 21st inst., the men would stop work on that date. At a meeting of the Commissioners held on the 14th, the Clerk was instructed to write to the Union expressing the hope of the Commissioners that the men would not adopt the serious step indicated by stopping work. The letter proceeded:

> They trust your members will await the result of the negotiations between the National Gas Council and the National Federation of General Workers, which the Commissioners are prepared fully to accept. It is expected that the decision will be issued very shortly. Further, the Government have under consideration a Bill now before Parliament to fix a standard week and the adjustments necessary in wages where night work and Sunday work are involved. . . . Finally, the Commissioners are willing

to refer the whole matter in dispute to an Arbitrator appointed by the Government, failing agreement. I am also to direct your attention to the Conspiracy and Protection of Property Act. Under this Act, fourteen days' notice must be given to my Commissioners by the shift men, and not seven, as you seemingly assume, before ceasing work.

A ballot was taken on Wednesday night as to whether the men should enforce their demand for a 44-hour week with 56 hours' pay for shift workers. It is understood that a large majority voted in favour of a strike. It was decided to hold a mass meeting on Friday night to consider whether, in view of the statement made in the Clerk's letter, seven or fourteen days' notice should be given. The meeting was duly held, at which it was reported that the Union officials had since the previous meeting had an interview with the Gas Commissioners; and that, in view of further information supplied and other conditions offered, the men had decided to remain at work pending consideration of these new issues.

THE CHEMICAL ENGINEERING GROUP.

The movement for the establishment throughout the country of a Chemical Engineering Group of the Society of Chemical Industry (within the Society), was considered at a meeting of the Birmingham and Midland Section last Thursday week, at the University of Birmingham. Mr. C. S. Garland, of the Central Committee of the Engineering Group; and Mr. H. Tolbot, the Hon. Secretary, attended in place of Prof. J. W. Hinchley, the Chairman. The two speakers pointed to the ever increasing importance of engineering in relation to manufacturing chemistry, and insisted that an organization was necessary which would charge itself with the task of endeavouring to promote the interests of chemical engineering, and its development on sound and scientific lines. The aims would be to collect and disseminate knowledge on chemical engineering, to foster research and higher training in the modern universities, to establish a Bureau of Information, and to form a reference library. The first conference of the group would take place at the annual meeting of the Society of Chemical Industry in July in London; and the subject for discussion by the group would be "Power Plant in Chemical Works."

The Chairman (Dr. S. Morrell, of Wolverhampton) urged that the advantage of the engineering group seemed to lie in closer co-operation between the chemist and the engineer—not so much to make the chemist an engineer, but to make the engineer a little more sympathetic in his dealings with the chemist.

Dr. E. W. Smith strongly commended the scheme, regarding it as one of the finest steps that had been taken in the chemical engineering world in recent years. A centralized Information Bureau would be a real boon to the chemical industrial and engineering world. Another important decision by the Engineering Group was that it intended to carry on its work within the parent Society. He was hopeful that it might be possible in Birmingham to propound a scheme which might be followed with advantage by other sections of the Society of Chemical Industry, the effect of which would be to check the disintegration that had been going on, by the creation of sectional organizations, in connection with the chemical industry. The time had arrived, he thought, for a reorganization of the constitution of the Society of Chemical Industry.

After some further remarks had been made,

Dr. E. Maxted (Walsall) said the engineering side of the industry had not been forgotten by the Society of Chemical Industry. The papers in the Society's "Journal" clearly showed this; but if by the formation of the group more technical papers on the chemical industry and on the construction of plant could be read, then the movement would justify itself.

Mr. Garland, in reply, said the Information Bureau would be prepared to supply data, but not advice.

IRON AND STEEL STOCKS.

Withdrawal of Control.

The Minister of Munitions draws the attention of all concerned to the Order made by him on Jan. 7 last, known as the Steel and Iron (Purchase and Returns) Order, 1919.

It may be explained that, during the war, part of the cost of production of iron and steel was met by direct subsidy from the Government. The subsidies in connection with the manufacture of pig iron have been continued to the 30th inst.; and in consequence the prices of pig iron (as well as of manufactured iron and steel made therefrom) have been restricted to prices below the economic level. After the withdrawal of subsidies at April 30, the entire cost of manufacture will have to be met by the iron and steel makers.

It was explained in the Ministry Notice published on Dec. 2, 1918, that steps would be taken to prevent any hoarding of subsidized material during the period for which the subsidies were continued. For this purpose, the above-mentioned Order was passed. It provides, in effect, that no person is entitled to increase his stock of iron and (or) steel by more than 100 tons, except under a permit from the Ministry, and that such permits should only be granted on condition that the holders should repay to the Ministry a drawback (representing the subsidies paid on the material by the Ministry) in respect of all such stock which may be held by them on the 30th inst. exceeding by more than 100 tons the amount of stock held by them on Oct. 31, 1915, or Oct. 31, 1918, whichever is the greater. The drawback referred to, which has been fixed at 30s. per ton in respect of iron and (or) steel, is a refund to the Government of the subsidies paid by it in respect of material which has not at that date been incorporated in any structure or plant or work in progress.

The Order further requires all persons who on the 30th inst. hold a stock of iron and steel, or either of them, of 100 tons or more to furnish to the Controller of Iron and Steel Production within fourteen days after April 30 a true and complete return of the stock of iron and steel held by them (*a*) on Oct. 31, 1915, or Oct. 31, 1918, whichever shall be the greater; and (*b*) on April 30, 1919. Forms of return for the purpose of the Order may be had from the Controller, Iron and Steel Department, Ministry of Munitions, Whitehall Place, S.W.1.

The Minister of Munitions desires to point out that the Order applies to all persons, whether iron and steel makers, merchants, stockholders, engineers, shipbuilders, or other users of iron and steel, who hold over 100 tons of iron and (or) steel on the 30th inst. Instructions as to the classes of iron and steel to be included will be found on the return form referred to.

It should be added that this return is called for under the powers conferred on the Minister of Munitions by the Defence of the Realm Act and Regulations; and any person failing to comply with the Order is liable to the penalties provided under the Act.

AMERICAN GAS AND BYE-PRODUCT FIGURES.

It appears from a report issued by the United States Geological Survey that the sales of artificial gas in America increased almost 30 p.ct. in 1917 over the figures of 1915. In 1917, the sales totalled 342,151,129,000 c.ft., of which 153,457,318,000 c.ft., or 45 p.ct., was water gas. This figure was an increase of 24 p.ct. over 1915. The sales of gas from bye-product coke-ovens, 131,026,575,000 c.ft., increased 55 p.ct. over 1915. The gas sold from coal-gas plants (bench retorts) decreased from 43,747,432,000 c.ft. in 1915 to 42,927,728,000 c.ft. in 1917. The sales of oil gas increased from 13,971,333,000 c.ft. to 14,739,508,000 c.ft., a gain of 6 p.ct. The total gas produced in coal-gas plants in 1917—sold as well as lost or used by producers—amounted to 47,525,148,000 c.ft., the manufacture of which consumed 4,960,297 net tons of bituminous coal, 106,627 gallons of oil, and 1296 net tons of cannel coal; the oil and cannel being used as enrichers. The total water gas produced—174,357,536,000 c.ft.—required 1,486,305 tons of anthracite, 7815 net tons of bituminous coal, 1,448,173 net tons of coke (most of it produced by the same operators in coal-gas retorts), and 684,620,637 gallons of gas oil. The total oil gas produced—17,552,855,000 c.ft.—required 137,484,874 gallons of oil. The quantity of bituminous coal charged into bye-product coke-ovens was 31,505,759 net tons, which produced 337,728,251,000 c.ft. of gas.

The sales of coke from coal-gas plants in 1917 amounted to 1,857,248 net tons, valued at $10,953,693, an increase of 12 p.ct. in quantity and of 52 p.ct. in value over 1915. The sales of bye-product coke in 1917 showed an increase over 1915 of 59 p.ct. in quantity and of 186 p.ct. in value. The total quantity of the two kinds of coke marketed in 1917 amounted to 24,296,528 net tons, valued at $149,596,846, a net increase of 54 p.ct. in quantity and 168 p.ct. in value over 1915. Higher average values per ton were obtained for both kinds of coke.

The sales of tar from plants manufacturing coal gas, water gas, and oil gas, and from bye-product coke-ovens was 335,578,441 gallons, valued at $8,631,993, in 1917, an increase over 1915 of 41 p.ct. in quantity and of 38 p.ct. in value. Oil-gas tar shows the greatest proportionate increase in quantity, and coal-gas tar the only increase in average value.

The ammonia produced is computed as its equivalent in sulphate. Coal-gas retorts and bye-product coke-ovens produced approximately 652,333,000 lbs. of sulphate, valued at $19,265,989, in 1917, an increase of 154,234,877 lbs., or 31 p.ct., in quantity, and of $8,068,863, or 72 p.ct., in value over 1915. Coal-gas ammonia showed a decrease in quantity and a small increase in value; whereas bye-product coke-oven ammonia increased in both quantity and value. Crude light oil, secondary light oil, benzol, toluol, and solvent naphtha aggregated 61,823,756 gallons, valued at $30,833,298, an increase of 245 p.ct. in quantity and 315 p.ct. in value over 1915. In 1917 the quantity of light oil obtained from coal-gas retorts was 770,298 gallons, compared with 526,651 gallons in 1915, a gain of 46 p.ct. The value of the product increased ten-fold. The quantity of light oil produced at water-gas plants in 1917 was 6,420,717 gallons, a gain, compared with the 788,876 gallons produced in 1915, of 5,631,841 gallons, or 714 p.ct. The value of the product increased twenty-fold. No light oil was recovered in the manufacture of oil gas in 1915; the total amount so produced in 1917 was 205,475 gallons. Oils produced at bye-product coke ovens increased from 16,600,857 gallons in 1915 to 54,426,266 gallons in 1917. Crude naphthalene increased from 688,790 lbs., valued at $50,524, in 1915 to 17,675,941 lbs., valued at $579,136, in 1917. Sales of retort carbon in 1917 amounted to 23,311 net tons, valued at $219,336, the greater part of which was produced in oil-gas retorts.

Free Gas and Electricity for Peace Celebrations.—The Gas and the Electricity Committees of the Bury Corporation have both decided to give free gas and electric current for illuminating purposes at the forthcoming peace celebrations.

The Late Mr. Channon, of Haywards Heath.—Allusion was made by the Chairman (Mr. E. C. Charleton), at the annual meeting of the Haywards Heath District Gas Company, to the sad loss that had been sustained by the death of Mr. P. P. Channon, who had been Engineer and Manager of the works for 25 years, and Secretary since 1917. He said that Mr. Channon's devotion to duty, and the interest he took in his work, called for the appreciation of all concerned; and in consideration of his long and valued services, the Directors had made a grant of £200 to his widow. He was sure the shareholders would gladly confirm the Directors' action, and associate themselves with the vote of condolence passed to Mr. Channon's widow and children. They were deeply indebted to Mr. R. S. Tobey, of Horley, for coming to the assistance of the Company during the interregnum between Mr. Channon's death and the appointment of his successor (Mr. A. E. Whitcher, of Burgess Hill). The grant was confirmed. The report adopted recommended a dividend making 3½ p.ct. for the year, which would leave £775 to be carried forward.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *April 22.*

There is no change to record in the London tar products market. Pitch remains firm at not below 65s. per ton in bulk at makers' works. Creosote is steady at from 6d. to 6¼d. per gallon net and naked. In other tar products, the position is unchanged.

Sulphate of ammonia also remains without alteration.

Tar Products in the Provinces.

April 22.

The average values for gas-works products during the week were: Gas-works coal tar, 34s. 6d. to 39s. 6d. Pitch, East Coast, 51s. 6d. to 52s. 6d. per ton f.a.s.; West Coast—Manchester 44s. to 45s.; Liverpool, 45s. to 46s., Clyde, 46s. to 50s. nominal. Benzol 90 p.ct., North, 1s. 9d. to 1s. 11d.; 50-90 p.ct., naked, North, 1s. 10d. to 1s. 11d. Toluol, naked, North, 2s. to 2s. 1d. nominal. Coal tar crude naphtha in bulk North, 8d. to 8½d. Solvent naphtha, naked, North, 2s. to 2s. 2d. Heavy naphtha, North, 2s. 7d. to 2s. 8d. Creosote, in bulk, North, salty, 4¾d. to 5d.; ordinary liquid, 5d. to 5¼d. Heavy oils, in bulk, North, 6d. to 6¼d. Carbolic acid, 60 p.ct., unsaleable. Naphthalene, £18 to £23; salt, £6 to £7, bags included. Anthracene, "A" quality, 6d. to 7d. per minimum 40 p.ct.; "B" quality 2d. nominal.

Price of West Coast Pitch.

The price of West Coast pitch in the "Journal" for March 18 and 25 was, by a clerical error, given as 45s. to 50s., whereas it should have been 45s. to 46s.

FROM A MARKET CORRESPONDENT.

Tar Products.

The incidence of Easter and the break which the holiday will cause this year has quietened markets for a few days past; but the general conditions, apart from this, remain fairly satisfactory. Inquiries on home and export accounts are approaching a more normal volume. Pitch remains a firm spot in London, and requirements for road purposes are having their effect gradually upon quotations. The scarcity of fuel has also brought about an increased demand for this product, which is now selling much more freely in Provincial centres, particularly the North, than was the case a short while ago. Creosote oil, likewise, secures a ready market as more shipping is launched. During the war, the Admiralty took practically all that was produced; but the full output is now being disposed of for peace-time purposes. Naphthas are dull, solvent particularly so; and no improvement is likely until the rubber industry comes into the market. So far as I can hear, this is hardly likely yet, as heavy stocks of rubber goods are still held by the Government and various Red Cross Societies, &c. Until this stock is cleared, a revival of demand for solvent naphtha is impossible. Benzol still has a good market. This product is, I learn, being used as fuel in more than one of the aeroplanes competing in the Transatlantic flight. Naphthalenes have not moved much. Toluol and cresylic acid are without change. Carbolic acid is still hopeless, and pyridine is weak. Before the war the latter product was absorbed mainly by German and Russian manufacturers of methylated spirit; so that new outlets are essential. Reduced bye-product outputs are likely during the next week or so, on account of a lower production at the collieries owing to the holidays. Following this there is the withdrawal of the subsidy to iron makers. It will be of interest to see whether the course of the bye-product coking industry will be affected thereby.

The range of home quotations is as follows:

Benzol: 90% London, 2s. 1d. to 2s. 3d. per gallon; 50-90%, 1s. 11d. to 2s. 2d. per gallon.

Carbolic Acid: Crude 60's unsaleable; crystals, 40%, 4d. per lb. asked.

Crude Tar: London, 40s. to 41s.; Midlands, 34s. to 36s.; North 35s. per ton *ex* works.

Pitch: London, 65s. to 70s. per ton; East Coast, 49s. to 52s. per ton; West Coast, 45s. to 47s., with Manchester 45s. per ton and Glasgow 47s. 6d. per ton; South Wales, 53s. per ton.

Solvent Naphtha: London, 2s. 4d. to 2s. 6d. Provinces average 2s. 3d. per gallon.

Crude Naphtha: Naked, 10d. per gallon.

Heavy Naphtha: 2s. 7d. per gallon.

Naphthalene: Refined, £20 to £22 per ton nominal; crude, £5 10s. to £10, according to quality.

Toluol: Naked, 2s. 1d. to 2s. 3d. per gallon nominal.

Creosote: London, 7⅞d.; North, 6¾d. to 7d.; heavy oil, 7¼d. per gallon in bulk.

Anthracene: 40-45%, 4½d. to 8d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 per ton f.o.r. makers' works.

Aniline Oil: 1s. 2d. per lb.

Cresylic Acid: 95%, 2s. 9d. to 3s.; 97-99%, 3s. to 3s. 3d. *ex* works London; f.o.b. other ports.

Sulphate of Ammonia.

Production is being maintained, and trading is fairly regular. Although little export business is being transacted, the home demand at present absorbs the output. Increased attention is being given to the future, and prospects after June 1, when there will be more freedom, are being eagerly discussed. Meetings are being held by the leaders of the trade to decide on their course of action when restrictions

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"READ THE PRESSURE BY THE POINTER."

No liquid to evaporate and no levels to adjust.

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Agents: Australia—FYVIE & STEWART, 360, Collins St., Melbourne; Canada—W. P. ROPER, 502, Merchants' Bank Building, Montreal.

are removed; and primary consideration is being given to the elimination of unfettered competition when the control disappears. I hear, however, that there is very little likelihood of competition becoming acute; the idea being rather to organize the business and co-ordinate its activities. While it is not intended to hamper industry, the aim is to keep prices at a level which will enable business to increase and be profitable. The future depends to a large extent, as I said before, on the situation regarding nitrate of soda. The Nitrate Executive, acting on behalf of the Allied Governments during the war, has been wound-up, and the surplus stocks held in this country for account of the Ministry of Munitions are now in the hands of the Board of Agriculture. At present, the agricultural community is not much interested, having little use for nitrate of soda at £20 per ton when sulphate of ammonia, containing more nitrogen, is available at £16 15s. The position next season will be entirely altered. The Nitrate of Soda Control Order will be suspended from May 15, and very shortly the Chilian fertilizer, with freights falling, will be offered at prices approaching the pre-war level. The fall in exchange, wages, fuel, and bags is reducing the cost of production; and although producers are asking 10s. 1d. per quintal f.o.b., they will probably soon be glad to accept 9s. in order to clear off their stocks, which, there is authority for stating, amount to over a million tons. The use of nitrate for home agricultural purposes will, of course, follow, and will set free a certain quantity of sulphate for export. This would seem advantageous, since anything that will assist export trade is good for the country, in order that the very heavy adverse trade balance against us may be modified even to a slight degree. In France there is no change in conditions since my last report; while in America general dullness prevails, and quotations for the moment are regarded as nominal.

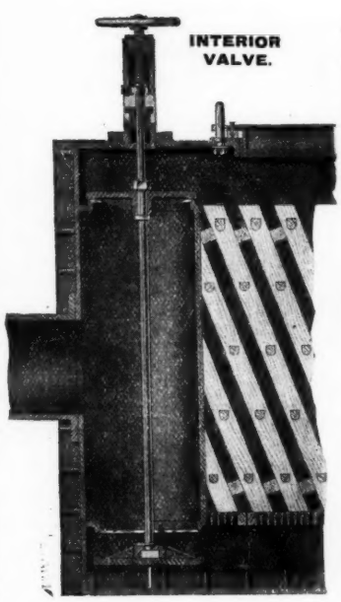
A Short Strike at Perth.—The employees of the Perth Corporation some time ago made application for increased pay; the general demand being for 30s. above pre-war wages. The Town Council favoured arbitration; but on a ballot the men were almost unanimously opposed to this method of settlement. At a mass meeting of the men, a suggestion that 48 hours' notice should be given, was rejected; and a decision was come to that the employees should not resume work on the following morning. This course was taken; and much inconvenience resulted. At the gas-works, the pressure was reduced in the morning; and the citizens provided themselves with ample supplies of candles and paraffin oil, which, however, were not required, as during the evening a fairly good pressure of gas was maintained. Householders possessing gas cookers and other appliances were terribly handicapped; and industries dependent on the gas supply for carrying on their business were considerably disorganized. During the evening, a settlement was arrived at. After protracted negotiations, the Town Council by a majority adopted a resolution providing for a flat advance of 5s. per week, with a minimum of 20s. a week, to all workers over pre-war rates; the increase to be retrospective from Feb. 7, the date of the application.

Canterbury Gas and Water Workers' Wages Arbitration.

The Court of Arbitration have had before them a reference by the Canterbury Gas and Water Company and the Workers' Union. The claim submitted on behalf of the Union members employed by the Company was for a substituted rate: (1) Payment of a war advance of 23s. 6d. a week, *plus* 12½ p.ct. on earnings; (2) the terms and conditions of the award (No. 269) of the Court of Arbitration of Feb. 25, 1919 (Gas Workers). Representatives of the parties were heard on April 3. The award (No. 269) of the Court of Arbitration of Feb. 25 granted to gas workers an advance of 5s. a week. As the result of an application by the Union to the Company for the terms of the award (No. 1068) of the Committee on Production of March 27, 1918, to be granted to the men concerned, a joint meeting was held on July 27, 1918, when an agreement was reached providing that existing emoluments should continue; that shifts should be reduced from 12 to 8 hours; and that there should be granted certain increases in wages, together with the bonus of 12½ p.ct. on earnings. Clause 4 of the agreement of July 27 provided that no further claims were to be made for a period of at least twelve months from that date unless "very unprecedented circumstances" arose. The Union made a further application for an increase in wages on the grounds that the high cost of living was an "unprecedented circumstance." The Company thereupon offered, in January, 1919, an advance of 5s. a week, which was not accepted. The award of the Court is as follows: The men concerned, aged 18 years and over, shall receive an advance of 5s. a week, payable at the rate of 10d. a day or shift for each day or shift worked. The amount hereby awarded is to be taken into account in the calculation of payment for overtime and night duty, and for work on Sundays and holidays (where extra payments are made for such work). The amount hereby awarded is to be regarded as a war advance, and is to be recognized as being due to, and dependent on, the existence of the abnormal conditions prevailing in consequence of the war. This award shall take effect from the beginning of the first full pay following Jan. 1 last.

Imperial Continental Gas Association.—Shareholders are informed by the Secretary (Mr. Robert W. Wilson) that the annual ordinary general meeting of the Association will be held at the Cannon Street Hotel on Tuesday, May 6, at 2.30. The Directors regret that, owing to the continued absence of returns from the stations, it will not be possible to submit any report or accounts.

Advertising the Bye-Products.—According to the "Motor," the North Middlesex Gas Company affix a notice to their receipts which runs as follows: The Company now produce the undermentioned bye-products: Liquid ammonia, a substitute for soda, 1s. per bottle. Sulphate of ammonia, a valuable manure, 1s. 3d. per 7 lb. box. Benzol, a substitute for petrol, 2s. 3d. per gallon. "Start it," a necessity for every motorist, 2s. 6d. per bottle.



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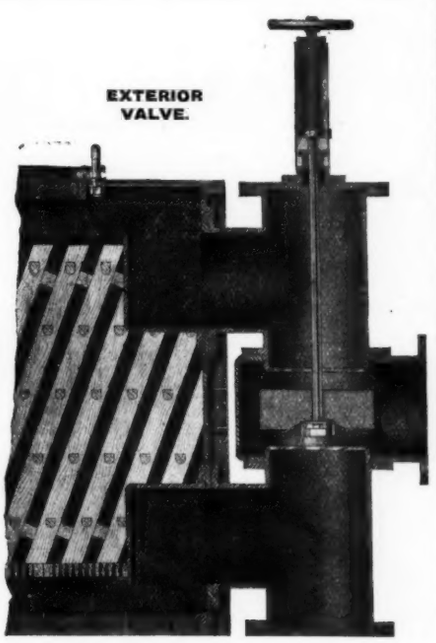

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MANCHESTER.

Cork in Darkness.—The local trade unionists having decided upon a general strike, the electricity and gas supply of Cork were cut off, and last Tuesday night the city was in total darkness.

Maximum Price at Walsall.—The Walsall Gas Committee report that the price of gas to all consumers has been further increased 3d. per 1000 c.ft. as from the meter readings for the March quarter. They recommend that application be made to the Local Government Board for an Order under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, authorizing the increase of the statutory maximum price of gas supplied within the borough of Walsall from 4s. to 5s. per 1000 c.ft.

Discharge of Gas Liquor into Sewers.—The report submitted by the Main Drainage Committee to the London County Council, on the subject of an application by the Gas Light and Coke Company to discharge certain waste gas liquor into the Northern outfall sewer adjoining the Company's works at Beckton, was received by the Council at their meeting last Tuesday; and the recommendation of the Committee that the Company be allowed so to discharge their liquor, upon certain specified terms, was adopted.

Quality of the Gas at Burnley.—At a meeting of the Burnley Chamber of Trade, complaint was made of the poor heating quality of the Corporation gas, which was said to cause much waste. It was stated that, according to the Corporation's own reports, the heating property of the gas had fallen from 514 B.Th.U. in May, 1917, to 468 B.Th.U. now. Strong objection was also made to the Corporation's intention to increase the price of gas, and at the same time to reduce the heating power. It was agreed to make representation to the Local Government Board on the matter.

Peoples Gas Company of Chicago.—In their report covering the operations of the Company for the year to Dec. 31 last, the Directors state that there was a net deficit for the twelve months of $1,366,628, of which amount $1,092,813 has been made up by transferring the total of the contingent reserve created for such an emergency—the balance of $273,814 being taken out of the accumulated surplus earnings of previous years. The accounts show that, after allowing for the increased production of gas and for the large income received during war time from light oils, the labour and material items of exceptional increase for the year 1918 over 1915 amounted to $4,967,324. It is hoped, as a result of the increased rates for gas and the expectation of decreased cost, in consequence of the stoppage of war activities, that the year 1919 will show a greatly improved condition of the revenue account, notwithstanding the reduction of income owing to the stoppage of the Government demand for light oils. The Company filed, on Jan. 17, 1918, with the State Public Utilities Commission, a petition asking for an immediate increase in rates to offset the abnormal cost of the manufacture of gas. On July 30 an increase in rates amounting to 27½ p.ct. was granted, which became effective as to all bills rendered on and after Sept. 1, 1918.

Joint Industrial Council for the Gas Industry.—In support of the scheme for a Joint Industrial Council for the Gas Industry, a conference of representatives of employers and employed was held last Tuesday at the Ministry of Labour, when the details of a draft constitution on the lines suggested in the Whitley report were discussed. General agreement was expressed with the scheme. The proceedings were adjourned until after the Easter holidays.

Dublin Public Lighting.—At a meeting of the Dublin Corporation last week, a report of the Public Lighting Committee recommending a re-arrangement of the lighting staff at the Tara Street station was rejected by a majority. Mr. Foley said the report dealt with an anomalous department, which had doomed the city, or a great portion of it, to darkness, and upon which £45,000 per annum was expended. For six months of the year not a single lamp was lighted in the added areas—extensions beyond the old city—and yet the Committee's expenditure had been increased by £14,000 a year. The meter-testing department used to be a paying concern; but now there was a loss upon it of £200 a year. Mr. Mahon (the Chairman of the Committee) said they had merely carried out the Council's request that they should report on the merits of the respective employees.

Vertical Retorts for Ballymena.—The Ballymena Urban Council have considered the report by Mr. J. D. Smith (the Engineer and Manager of the Belfast Corporation Gas-Works), as to his inspection of the Council's works. In this he had stated that the approximate cost of plant that was necessary would be £13,000, and that a saving of about £2000 per annum would be effected, which would meet interest and redemption, and leave a considerable profit margin. A Sub-Committee of the Council reported on visits paid to the gas-works at Lurgan, Holywood, and Bangor, where they found vertical retorts in operation, and verified facts and figures given by Mr. Smith. After full consideration, they were of opinion that the Council should have eight vertical retorts substituted for the existing retort-bench, being convinced that the annual saving in coal alone would meet the principal and interest for repayment of loan. The Council adopted the Committee's report, and ordered that plans and specifications be prepared and application made to the Local Government Board for Ireland for a loan of £13,000.

The Spenborough Urban District Council decided at the last meeting to increase the salary of Mr. A. L. Jennings, the Gas Engineer, by £63 15s.

Tully's carburetted hydrogen plants are about to be erected by Messrs. Bale & Hardy at Holyhead and Newark—of a capacity respectively of 100,000 and 300,000 cubic feet.

The Directors of the Oriental Gas Company, Ltd., have resolved to pay, on May 31, an interim dividend at the usual rate of 3½ p.ct., less income-tax, on account of the year ending June 30 next.

SAWER & PURVES,

THE POSITIVE DRY PREPAYMENT METER

MANCHESTER & NOTTINGHAM.

STOCK MARKET REPORT.

LAST week, with its short spell for business of four days (Good Friday docking it of the fifth) and a prolonged holiday interval confronting it at the close, was naturally a quiet one on the Stock Exchange, and offered no incident of arousing interest. The tone varied to some extent from time to time; but on the whole it was fairly good, and at the close seemed as firm as at any period.

In the gilt-edged market, Home Government issues opened well, and the 5 p.ct. Loan and Consols had a slight advance. Next day they took an easier turn; but on Wednesday the Loan recovered, and on Thursday advanced to 96 13/16. Indians were depressed by the reported disturbances. Home Rails were very quiet, and what few transactions were marked showed irregular tendencies. Canadians were fairly firm, and Argentines better on the whole.

In the Foreign Market, French Loans oscillated almost daily, and Brazilians and Japanese were lower. In Miscellaneous, Rubber was only moderate; but Oil maintained its strength. There was some demand for Breweries.

Business in the Gas Market was quite active considering the holiday handicap, and the tone was generally satisfactory. In the Metropolitan, Suburban, and Provincial groups prices were quite steady, and there was not a single variation made in their quotations. In Continental, Imperial Continental was much dealt in, and underwent some reaction from its recent phenomenal rise. On Monday it touched 135, the next two days 132 was its best score, and on Thursday it ranged from 130 to 133½. The loss in quotation was 2½. In Primitivas, both ordinary and preference were active and in better favour; the former reaching 28s. 9d. and the latter 51s. 3d.

Bargains done for cash during the week were as follows: On Monday, Commercial 4 p.ct. 62, ditto debenture 51½, European 12½, 12⅞, Gas Light ordinary 62, 62¼, 62¾, 63, Imperial Continental 131, 131½, 132, 132½, 133, 133½, 134, 135, Monte Video 9 9/16, 9⅝, Primitiva 25s., 25s. 6d., 26s. 6d., ditto preference 45s. 7½d., 46s., 47s., 47s. 6d., South Metropolitan 62⅜, Wandsworth and Putney (Wimbledon) 68½, 68¾. On Tuesday, Buenos Aires debenture 50, Commercial debenture 51½, 52, Gas Light ordinary 62½, 62⅝, 62¾, 63, ditto maximum 55½, Imperial Continental 130, 130½, 131, 131½, 132, Monte Video 9⅜, Portsea "C" 62 5/16, Primitiva 25s., 26s. 3d., 27s. 3d., 27s. 6d., 28s., ditto preference 45s., 47s. 3d., 47s. 6d., 48s. 9d., 50s., South Metropolitan 62, 62½, 62¾, ditto debenture 54½, South Suburban 77½. On Wednesday, Alliance and Dublin 48½, Brighton and Hove ordinary 95½, 96, Cape Town debenture 64½, Gas Light ordinary 62½, 62⅝, 62½, 63, ditto preference 70½, 71, ditto debenture 56⅜, 57, Imperial Continental 130½, 131, 131½, 132, Primitiva 28s. 9d., ditto preference 50s., 51s. 3d., South Metropolitan 62, 62⅜, 63, ditto debenture 55. On Thursday, Bombay 5 1/16, Continental Union 50, 50½, Gas Light ordinary 62½, ditto preference 71¼, ditto debenture 56⅞, Imperial Continental 130, 131, 131⅛, 131½, 132, 132½, 133, 133½, Primitiva 26s. 10½d., 28s. 9d., ditto preference 48s. 9d., 50s., 50s. 6d., 51s. 3d., South Metropolitan 63, Wandsworth "B" 60½, ditto debenture 50½, 51. On Good Friday, the Exchange was closed.

In the Money Market, rates were firmer at first; but they gradually relaxed and became quite easy. The Bank rate is 5 p.ct., as fixed on April 5, 1917.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	62 –67	
1,551,868	"	April 8	2½	2⅞%	Alliance & Dublin Ord.	59–64	48 –70	48½
874,000	"	July 10	4	4%	Do. 4 p.c. Deb.	76–79	61–68	..
280,000	5	April 29	7½	8%	Bombay, Ltd.	5⅞–6⅛	5⅞–6⅛	6 1/16
50,000	10	Feb. 26	16	12%	Bournemouth Gas and Water — 10 p.c.	25–30	24–28	..
888,110	10	"	7	7%	Bournemouth Gas and Water — B 7 p.c.	15–15½	10–11	..
115,000	10	"	6	6/-	Bournemouth Gas and Water — Pref. 6 p.c.	13½–14	9–9½	..
159,740	—	—	—	4%	Bournemouth Gas and Water — 4 p.c. Deb.	..	66–68	..
992,045	Stk.	Feb. 26	14	37/-	Brentford A Consolid.	261–266	76–79	..
734,920	"	"	11	31/8	Do. B New	204–209	70–75	..
55,000	"	"	5	5%	Do. 5 p.c. Pref.	109–111	78–83	..
221,400	"	June 11	4	4%	Do. 4 p.c. Deb.	91–93	65–67	..
317,880	"	Feb. 26	11	7½%	Brighton & Hove Orig.	208–213	137–142	..
244,200	"	"	8	5⅛%	Do. A Ord. Stk.	154–159	94–99	93½–96
933,500	Stk.	—	5	5%	Bristol 5 p.c. max.	..	..	..
680,000	20	Mar. 26	12½	10%	British	44–45	30½–31½	..
190,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88–90	64–66	..
345,771	"	"	4	4%	Buenos Aires 4 p.c. Deb.	85–87	50–53	50
100,000	10	—	—	—	Cape Town & Dist., Ltd.	1½–2½	3⅜–4½	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4–6	7⅜–8½	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70–75	60–66	64½
157,160	"	Feb. 26	5	5%	Chester 5 p.c. Ord.	108–110	..	
1,513,280	"	Feb. 19	5/9/4	80/-	Commercial 4 p.c. Stk.	108–108	69–65	62
580,000	"	"	5½	26/3	Do. 3½ p.c. do.	108–105	59–62	..
475,000	"	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½–71½	51–53	51½–52
800,000	"	"	4	—	Continental Union Ltd.	75–79	48–53	50–50½
200,000	"	"	7	7 p.c. Pref.	Do. 7 p.c. Pref.	115–118	70–75	..
51,600	Stk.	Aug. 29	14½	12½%	Croydon A 10 p.c.	..	155–165	..
278,400	—	"	11⅛	9⅝%	Croydon B and C 7 p.c.	..	130–135	..
492,270	Stk.	—	6	5⅛%	Derby Con. Stk.	128–125	..	..
55,000	"	—	4	4%	Do. Deb. Stk.	102–104	..	..
1,002,180	10	July 29	10	5/0	European, Ltd.	17½–18	12½–13½	12½–12⅞
16,298,976	Stk.	Feb. 10	4/17/4	80/-	Gas Light and Coke — 4 p.c. Ord.	98–102	62–64	62–63
2,600,000	"	"	8½	26.8	Gas Light and Coke — 3½ p.c. max.	76–79	55–57	55½
4,062,285	"	"	4	4%	Gas Light and Coke — 4 p.c. Con. Pref.	96–99	70–72	70½–71½
4,674,850	"	June 11	8	8%	Gas Light and Coke — 3 p.c. Con. Deb.	72½–74½	56–58	16⅔–67
180,000	"	"	10	10%	Gas Light and Coke — 10 p.c. Bonds	..	..	..
82,500	"	Mar. 12	5	4½%	Hastings & St. L. 5 p.c.	..	59–64	..
268,740	"	—	3½	2⅞%	Do. 3½ p.c.	87–89	44–49	..
70,000	10	April 29	11	8%	Hongkong & China, Ltd.	16½–16¾	7⅜–7⅝	..
86,600	Stk.	Sept. 12	9	8½%	Hornsey 7 p.c.	..	115–120	..
131,000	"	Mar. 12	7½	5½%	Ilford A and C.	151–154	90–95	..
65,780	"	"	6⅔	4½%	Do. B	115–118	69–74	..
66,500	"	June 26	4	4%	Do. 4 p.c. Deb.	92–94	62–65	..
4,940,000	"	May 14	9	4½%	Imperial Continental	150–160	130–135	130–135
1,235,000	"	Feb. 12	8½	3½%	Do. 3½ p.c. Deb. Red.	84–86	72–74	..
235,249	"	Mar. 12	6⅔	6⅔%	Lea Bridge Ord. 5 p.c.	119–121	90–95	..
9,498,906	"	Feb. 26	10	42/6	Liverpool 5 p.c. Ord. A	211–213	..	..
					Liverpool 5 p.c. Ord. B	146–148	..	..
806,098	"	June 26	4	4%	Do 4 p.c. Pr. Deb. Stk.	..	58–63	..
165,736	"	Feb. 17	7/5/6	31%	Maidstone 5 p.c.	..	..	..
76,000	5	June 11	6	3%	Malta & Mediterranean	4½–4¾	3½–3⅔	..
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99–101	90–97	..
541,290	20	May 28	4	6/-	Monte Video, Ltd.	11½–12	9⅜–9⅞	9 9/16–9⅝
1,875,892	Stk.	July 29	4½	3⅝%	Newcastle&Gatsh'd Con.	98½–99½	70½–71½	..
539,796	"	June 26	3½	3½%	Do. 3½ p.c. Deb.	85–88	67–68	..
55,940	10	Feb. 26	7/14/0	7/0	North Middlesex 7 p.c.	14–15	9½–9⅔	..
800,000	Stk.	May 14	8	8%	Oriental, Ltd.	117–122	103–106	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½–7⅝	4⅜–5½	..
60,000	50	Feb. 26	15	7½%	Portsea, Island B	128–131	76–81	..
100,000	50	"	12	6⅔%	Do. C	118–121	58–63	62 5/8
249,980	5	April 29	8	—	Primitiva Ord.	5½–6	1½–1⅝	25/—28/9
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4½–5	2½–2⅞	45/—51/3
621,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91–93	74–76	..
600,000	Stk.	July 31	4	4%	Do. " " 1911	..	46–49	..
848,198	"	June 26	4	4%	River Plate 4 p.c. Deb.	85–87	48–52	..
150,000	10	May 14	6	6/-	San Paulo 6 p.c. Pref.	10½–11	7⅛–8	..
125,000	50	July 1	5	5%	San Paulo 5 p.c. Deb.	47–49	40–42	..
135,000	Stk.	Mar. 12	10	5%	Sheffield A	228–234	83–85	..
209,984	"	"	10	5%	Do. B	229–234	83–85	..
528,800	"	"	10	4⅔%	Do. C	220–222	82–84	..
133,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	..	..	..
90,000	10	May 28	9	6/-	South African.	10½–11⅛	13–14	..
6,609,895	Stk.	Feb. 10	5/4/0	80/-	South Met. 4 p.c. Ord.	111–113	62–65	62–63
250,000	"	July 12	—	5%	Do. Pref.	..	95–97	..
1,895,445	"	July 10	3	3%	Do. 3 p.c. Deb.	72½–74½	54–56	54½–55
294,890	"	Feb. 26	8½	5%	South Shields Con. Stk.	157–159	112–114	..
952,795	"	"	6	3⅔%	S'th Suburb'n Ord. 5 p.c.	114–116	76–79	77½
197,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116–118	89–93	..
647,740	"	May 14	5	5%	Southampton Ord.	99–102	69–71	..
120,000	"	Feb. 12	7½	4⅝%	Tottenham and District — A 5 p.c.	135–138	90–95	..
782,275	"	"	6	3%	Tottenham and District — B 3½ p.c.	115–117	65–67	..
181,255	"	June 26	4	4%	Tottenham and District — 4 p.c. Deb.	87–89	64–66	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5–6	1–2	..
142,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93–95	45–50	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	108½–109	83–85	..
					Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151–156	88–93	..
80,000	"	Feb. 26	8⅜	55/-	Do. B 3½ p.c.	129–134	68–73	69½
235,686	"	"	6⅔	40/-	Do. C	..	68–73	..
104,075	"	"	—	38/6	New Ordinary	..	68–73	..
140,365	"	"	—	34/6	Wimbledon 5 p.c.	117–122	64–73	68½–68¾
862,000	"	"	5½	53.9	Epsom 5 p.c.	121–126	70–75	..
98,000	"	"	6⅔	40/-	3 p.c. Deb. Stk.	68–72	50–52	
92,416		June 26	3	3%				

* Ex div.

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A. E. Coombes,
Secretary.

Ryde, I.W.,
April 16, 1919.

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